Final
Environmental Impact Report

Proposed Unreinforced Masonry Ordinance

Prepared For:
City of San Buenaventura
Community Development Department
501 Poli Street, Ventura, California

October 1991

The PLANNING CORPORATION
Post Office Box 20250
Santa Barbara, CA
93120

FINAL ENVIRONMENTAL IMPACT REPORT
ON THE
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The Planning Corporation
Post Office Box 20250
Santa Barbara, California 93120
(805) 966-5959

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CHAPTER 1

INTRODUCTION

1.1 Purpose and Format

Environmental Impact Reports (EIRs) are required under the California Environmental Quality Act (CEQA) when projects such as the proposed **Unreinforced Masonry Ordinance** are anticipated to have potentially significant effects on the environment. Site specific as well as regional and cumulative impacts are considered in the impact evaluation process. The purposes of an EIR are to identify the significant impacts of a project on the environment, to decide which of these significant effects can be mitigated or avoided, and to evaluate alternatives to the project as proposed. An EIR is intended to serve as an informational document for decision makers and the general public regarding the environmental consequences of a project.

The report writers have made maximum use of pertinent policies, guidelines, and existing reports and documentation to perform the impact assessment and design mitigation measures. Primary planning documents referred to include: the Comprehensive Plan, Unreinforced Masonry Structural Inventory, a variety of building engineering evaluations, prior studies conducted by the City regarding unreinforced buildings, comparative data from the Cities of Watsonville, Santa Cruz, and San Francisco, the Uniform Building Code, Zoning maps, and various land use planning and impact assessment guidelines. Copies of pertinent documents and guidelines are on file in the Community Development Department of the City of San Buenaventura and the Ventura County Public Library. Technical reports prepared for other adjacent projects which were used as baseline data for this EIR are also available for public review in the City Community Development Department.

This EIR has been designed to serve as a working document for decision makers, City staff, the general public, and affected property owners. The document contains an initial impact summary presenting the significant EIR findings in table and narrative form. These summaries are followed by a detailed project description. A thorough analysis of potentially significant impacts comprises the main text of the document. The report concludes with an analysis of alternatives to the proposed project and recommendations.

1.2 Impact Classification

Different categories of impact significance require various administrative actions by the decision makers at the time a project is approved. Conclusions about the significance of an impact are highlighted in **bold print** in the document. In the analysis to follow, several impact evaluation distinctions have been made. The different types of impacts that have been distinguished include:

Class I = Significant adverse impacts which **cannot** be mitigated or avoided. A significant unmitigable adverse impact is a problem for which the consultant and City staff have been unable to find a solution. These impacts require decision-makers to make findings of overriding consideration if the project is approved.

Class II = Mitigable adverse impacts which **can** feasibly be mitigated or avoided. In these cases, the consequences of a project are considered sufficiently serious that some form of mitigation planning is needed. These mitigations can involve modifications to the project, changing the project design to avoid conflicts with environmental values, or performing data collection procedures prior to construction (such as archaeological data recovery programs). Mitigable adverse impacts are problems for which solutions can be conceived and feasibly implemented. Decision-makers are required to make findings that impacts have been mitigated as completely as possible to approve a project with Class II impacts.

Class III = Adverse impacts which are not significant. Insignificant adverse impacts describe the consequences of a project that are not sufficiently disruptive to require mitigation measures. Modest changes in the environment that have no serious consequences on the abundance or diversity of plant or animal life, for example, are usually classified as adverse but not significant. Minor changes in traffic flow, aesthetics, or air quality are other examples of insignificant impacts. There are factual tests recommended in the Appendices to CEQA that aid in this classification process.

1.3 Scope

In June of 1989, the City's Environmental Impact Report (EIR) Committee and Planning staff reviewed an environmental assessment of the proposed project. This review was undertaken after various ordinance options were subjected to more than a year of independent study by the City Building and Safety Division and engineering consultants retained by the City. As discussed in the Background to the project (Section 1.1 of the Project Description), the City Council reviewed alternative ordinance proposals on several occasions and ultimately remanded the selection of an ordinance option to the EIR Committee for detailed study. The Committee ultimately recommend an EIR be prepared. This document was prepared in response to the public controversy generated by the proposed ordinance.

The scope of the environmental analysis was determined by the City's EIR Committee. Relevant topics that are discussed in the EIR include:

- Project Description and Environmental Setting
- Land Use and Planning Considerations
- Geology, Soils and Seismic Hazards
- Construction Effects
- Socio-Economic Effects
- Scenic and Visual Resources
- Cultural Resources
- Growth Inducement and Other CEQA Sections
- Alternatives

In addition, the document contains:

- a review of the predicted performance of unreinforced buildings in the City in several types of earthquakes;
- a cost-benefit analysis of various types of upgrade options; and
- a detailed evaluation of various strengthening activities and upgrade programs.

Subsequent to initiation of the study program for the EIR, the Loma Prieta earthquake occurred in October, 1989. In response, the consultant proposed that the EIR be expanded to include information about the performance of unreinforced masonry buildings in this earthquake. In addition, because of the extensive collapse of bridges and highway segments in areas subject to soil amplification, a decision was made by City staff to include an evaluation of several significant highway bridges within the City to determine if these structures could withstand moderately severe ground accelerations resulting from earthquakes occurring in the vicinity of Ventura.

Therefore, the ultimate scope of the EIR was revised, expanded, and finalized in January of 1990. The engineering firm Rutherford & Chekene was also added to the technical staff for EIR preparation at this time. This firm developed the hazards analysis model for unreinforced masonry buildings used by the City of San Francisco in preparing an EIR on proposed ordinances for that City. This model was subsequently adapted for Ventura conditions and buildings; the results of the simulation produced by the model are described in Chapter 6 of the EIR.

This EIR has been prepared by the **Planning Corporation** under contract with the City of San Buenaventura, the lead agency as defined by CEQA. The City sent a Notice of Preparation (NOP) to government agencies and concerned groups to solicit input regarding the content of the environmental document. Responses to the NOP for the Draft EIR, and a copy of the City staff's Environmental Assessment are presented in the EIR Technical Appendix.

1.4 Use of the Document by the City of San Buenaventura

Because this EIR will be used to generate a comprehensive planning analysis prepared by City staff, it is essential that the information presented be accurate, complete, and timely. Therefore, this document was initially offered to the public, and City staff as a draft statement about the environmental consequences of the project. Based on the outcome of the public review process for this report, further investigations, revisions to the Draft EIR, and additional studies and discussion were necessary to finalize the report. Prior to the end of the public review period, a hearing was held before the City's Environmental Impact Report Committee. Copies of the minutes of the public hearing and written comments submitted by the public are presented in Chapter 14. Responses to each comment were provided by the consultant.

1.5 Socio-Economic Analysis and CEQA Limitations

Guidelines to CEQA and case law specify that economic and fiscal effects on individuals or groups effected by a proposed project are not necessarily considered environmental impacts. However, the Guidelines do permit a jurisdiction to include economic considerations within the scope of CEQA analysis. These socio-economic or fiscal effects should not be treated as components of the natural or physical environment, however. CEQA Guidelines section 15131 provides that economic and social effects may be analyzed if logical link of cause and effect can be ascertained where such effects prompt physical changes in the environment. CEQA does not require the analysis of social or economic impacts along with impacts on the physical environment. Nothing in CEQA, however, precludes a local agency from analyzing social or economic impacts in addition to impacts on the physical environment if the agency determines, as a matter of policy analysis, that an economic evaluation is appropriate.

In this EIR, social and economic considerations are being analyzed as policy considerations only and not as environmental impacts since these effects do not have any necessary, direct connection with impacts on the natural and physical environment. The presentation of this information is designed to assist decision-makers in determining future policy. Chapters of the EIR which generally concern CEQA related environmental impacts are:

Chapter 3	Project Description
Chapter 4	Environmental Setting
Chapter 6	The Geology and Seismicity of Ventura County
Chapter 9	Cultural and Visual Resources: Special Considerations for Reinforcement Technology
Chapter 10	Construction Effects
Chapter 12	Alternatives
Chapter 13	Other CEQA Sections.

The portions of the EIR that define the scope of impacts on the physical and natural environment are:

Chapter 7	Predictions Regarding the Performance of Unreinforced Structures in Ventura, and
Chapter 8	Loma Prieta Earthquake: Important Comparisons for the City of Ventura.

Some portions of the document which not directly related to CEQA concerns includee:

- o Chapter 5 — The Engineering Problem and Alternative Solutions, and
- o Chapter 11 — Costs and Benefits: Policy Implications of a Mandatory Strengthening Program.

1.6 Preparation of the Final EIR

The draft EIR was published on March 22, 1991 and the forty-five day review period for the document concluded on May 14, 1991. During this time period, comments were received from State agencies, County agencies, one City within Ventura County, members of local interest groups, unreinforced masonry building owners, members of the public with a financial interest in upgrading requirements, and other members of the public without a financial interest in the buildings that are the subject of the proposed ordinance.

In response to these comments, substantial additional information was included in chapters 6 through 12. The additional research included in the Final EIR resulted in documentation of a number of fiscal and economic conditions related to the proposed ordinance. However, these modifications did not result in significant changes to the impact analysis conclusions or findings pertinent to CEQA concerns. Virtually all of the changes made in the document expanded upon on previously described impacts or provided information about the fiscal and economic effects of the ordinance which will have no effect on the natural or physical environment. In some cases, additional information collected after circulation of the Draft resulted in deletions to the Draft EIR text. All text revisions made subsequent to the draft EIR have been identified by the placement of a line in the margin (as shown adjacent to this paragraph).

CHAPTER 2

SUMMARY OF THE PROPOSED PROJECT, ENVIRONMENTAL EFFECTS, AND ALTERNATIVES

2.1 Revisions in the Final EIR in Response to Comments on the Draft

In response to comments on the Draft, the EIR summary was revised to provide a concise summary of findings and recommendations. The summary was organized with two purposes: to summarize the most pertinent conclusions in the EIR and to provide a brief summary of portions of the Draft EIR that generated public controversy.

2.2 Purpose of the EIR

The following environmental document is a law and policy EIR that describes and evaluates the effects of an ordinance proposed to enhance life safety and encourage building damage reduction in the event of a moderate to major earthquake. The proposed ordinance concerns a specific type of building: unreinforced masonry structures. The law that is discussed is an ordinance comprised of both administrative actions and required construction activities that must be accomplished within a specific timeframe depending on the occupant load of a building. The policy aspects of the project are not necessarily overt or obvious, but an unreinforced masonry ordinance would establish a set of policies that may change the character and ultimately the land use intensity of the downtown area. Moreover, the absence of an ordinance is also a policy - though not an explicit one - that may have severe socio-economic consequences if a moderate to strong quake occurs. Comparative data from Santa Cruz and Watsonville, two California cities with historic downtown areas that were severely impacted by the 1989 Loma Prieta earthquake, are used in the EIR to describe the "No-Project" consequences of failing to adopt some form of building damage reduction program.

2.3 Scope of the EIR: Limitations on Socio-economic Analysis

Guidelines to CEQA and case law specify that economic and fiscal effects on individuals or groups effected by a proposed project are not necessarily considered environmental impacts. However, the Guidelines do permit a jurisdiction to include economic considerations within the scope of CEQA analysis. These socio-economic or fiscal effects should not be treated as components of the natural or physical environment, however. CEQA section 15131 provides that economic and social effects may be analyzed if logical link of cause and effect can be ascertained where such effects prompt physical changes in the environment. **In this EIR, social and economic considerations are being analyzed as policy considerations only and not as environmental impacts since these effects do not have any necessary, direct connection with impacts on the natural and physical environment.** The presentation of this information is designed to assist decision-makers in determining future policy. Chapters of the EIR which generally concern CEQA related environmental impacts are:

Chapter 3	Project Description
Chapter 4	Environmental Setting
Chapter 6	The Geology and Seismicity of Ventura County
Chapter 9	Cultural and Visual Resources: Special Considerations for Reinforcement Technology
Chapter 10	Construction Effects.

2.4 Alternative Approaches to Developing a Seismic Hazards Reduction Program for Ventura

During the past five years, the City of Ventura has considered how to achieve more complete compliance with State law that requires all governmental jurisdictions to inventory unreinforced masonry structures and to develop programs to minimize the life safety hazards of these buildings. The City of Ventura has completed the inventory phase of compliance and has a minimal program in place comprised of issuance of hazardous building notices which were sent to property owners. The City is presently evaluating how best to structure and implement a mitigation program to reduce hazards to the maximum extent feasible.

In developing a mitigation program, the City evaluated a broad range of alternatives ranging from mere recorded notification to building owners of a hazardous condition to mandatory structural modifications to achieve enhanced life safety protection in the event of a moderate to severe earthquake. The EIR considered four possible options for upgrading. These options include:

- A **Level I** program which involves anchoring the walls, securing the parapets, and providing out-of-plane strengthening. This upgrade (sometimes referred to as anchorage and interconnection) would require a relatively low level of strengthening. Unreinforced masonry walls would be anchored to floors and roofs and additional work would be done to prevent walls from collapsing (out-of-plane failure). Typically, this work would be confined to perimeter walls although strengthening may also be required of unreinforced interior walls in larger buildings if determined necessary as a result of structural analysis.

- A **Level II** program involves the basic **Level I** strengthening activities plus additional strengthening for buildings with any of the following conditions: an open store front, an open store front with a second floor, and excessively high but thin walls (an excessive height:thickness ratio). Not all of the buildings in the City's inventory would satisfy these **Level II** prerequisite conditions.

- A **Level III** program, similar to the Los Angeles retrofitting ordinance and based on the State Model Ordinance, would require Level I and/or II strengthening plus additional work on most buildings involving roof and floor strength upgrading and in-plane strengthening of exterior walls. The design standard for this work would be the Uniform Code for Building Conservation Appendix Chapter 1. The in-plane strengthening requirement represents a significant increase in construction requirements over Level I standards. Generally, the Level III construction program would exceed the disruptions of a major remodel and it is likely that extensive removal of finishes, installation of plywood shear wall, restoration of finishes and possibly installation of structural steel would be required.

- A **Level IV** program (which is only discussed very briefly) would require very considerable strengthening beyond the **Level III** standard. The design standard for this level of upgrade would be the 1988 Uniform Building Code (or current construction requirements for new buildings). Nearly all buildings would be required to add additional framing, to replace roof and floor members and surfaces, and to strengthen exterior masonry walls through the application of gunnite, shotcrete, or some other procedure. The **Level IV** standard is well in excess of **Level III** standards and represents a significant escalation of construction over other standards. In many cases, in addition to building strengthening work, new foundations would also be required. **From the outset, it should be understood that the costs of implementing this Level of upgrade are probably prohibitive for buildings located within the City of Ventura. This option is discussed briefly to demonstrate the level of effort needed to achieve virtual assurance of building damage reduction and complete life safety protection.**

There are several distinct methods available for reinforcing unstrengthened masonry buildings. The differences in approach and results, costs and inconveniences, damage reduction and life safety enhancement, are quite variable. One of the most recently promulgated approaches has been exposed to relatively few empirical tests in the form of strong intensity, long duration quakes. Yet, this approach (incorporated into the **Level III** option) has several advantages, including a low cost - high safety enhancement benefit. However, although this approach has a single major objective - life safety rather than building damage reduction - evidence suggests that falling wall elements still will expose individuals on the street to significant risks. **There is considerable disagreement among the experts regarding how to proceed in enhancing life safety through the retrofit process.**

2.5 Consequences of State Adoption of a Level III Standard into the Building Codes of Local Jurisdictions

In July of 1991, the Governor signed Assembly Bill 204 which mandates that the current version of the State Model Ordinance (UCBC Appendix Chapter 1) shall be adopted into the building codes of local jurisdictions within the State of California. Once the legislation becomes fully effective (after July 1, 1993), any City requiring a mandatory upgrade program will have to adopt this standard (which is, in essence, the State Model Ordinance currently being promulgated by the State Seismic Safety Commission). **This development puts the objective of adopting a less intensive standard, or a standard which is tailored to the needs and seismicity of a particular city or county, into a fixed time frame limited by the new law.** The new law has a 'grandfather" clause which will permit cities with technical standards adopted prior to mid-July 1993 to proceed with upgrade programs under locally developed ordinances. However, implementation of less stringent standards would require an applicant to obtain a building permit prior to July of 1993; building permits applied for after this date would need to comply with **Level III** standards.

There are a number of unresolved and confusing legal and administrative issues that have evolved as a result of this recent legislation. Apparently most cities and many interested lobbying groups with an interest in the unreinforced masonry problem were unaware of this development and considerable confusion has begun to evolve about how the adoption of this standard effects compliance with the State Unreinforced Masonry law. The original law passed by the state was passed with the legislative intent that standards would be established by local jurisdictions which would be responsible for designing a "mitigation plan" to comply with the law. With the passage of this new legislation, the original intent of the Unreinforced Masonry Law may have been undermined, at least to a degree. AB 204 does not require the adoption of mandatory strengthening but it does require the adoption of a **Level III** standard **if** a jurisdiction in Seismic Zone 4 ultimately establishes a mandatory strengthening program.

Since several cities with a large number of unreinforced buildings are currently in the final stages of considering programs with less intensive upgrade standards than the UCBC Appendix, it is somewhat unclear how these locally adopted standards will relate to the future change in the building code. For example, if a **Level I** program is adopted at this time and in the future if a building has a proposed change of occupancy or use that under normal UBC provisions would necessitate structural work, would the new standards apply or would the adopted ordinance prevail as the standard? Forthcoming implementing regulations to be promulgated by the State Building Standards Commission may result in clarification of how this law will be implemented. For cities such as Oakland, San Francisco, Santa Monica, and Ventura which are all considering multi-level strengthening standards (combined **Level I and III** programs for different types of buildings), the passage of AB 204 creates considerable confusion. Cities affected by this legislation are either reconsidering the advisability of interim, less stringent strengthening standards or preceding with adoption of alternative standards without delay.

Other legislation is currently being considered at the state level which may provide exemptions to unreinforced building owners attempting to comply with the new building code standards. Specifically, legislation has been proposed which would exempt conformance with handicapped requirements and current fire, plumbing, and electrical codes. Legislation has also been proposed which would require all jurisdictions to adopt a mandatory strengthening standard; with the adoption of AB 204, this mandatory standard, by default, would be a **Level III** program in Seismic Zone 4.

2.6 The Cost of Upgrading for Ventura Building Owners: Can Local Building Owners Afford to Fund Mandatory Upgrades?

In response to comments on the Draft EIR, the consultants conducted a data collection program to obtain detailed information about the economic status of every building owner in the city. The data collection effort is documented in the EIR Technical Appendix. In response to this questionnaire (which was sent to all 138 building owners potentially subject to the ordinance), a total of 70 responses (51%) were received. Of the total number of responses received, 11 (16%) were non-responsive, 16 (23%) were partially responsive, 8 (11%) were responsive but inconsistencies in the data made the information provided suspect, and 34 (49%) owners provided complete, apparently reliable responses to the data request. Some inconsistencies in these complete responses reduced to 29 (21%) the number of responses that could be used to project the effects of ordinance adoption.

Most owners providing complete responses had owned their buildings for at least 8 years. This final observation raised serious concerns about the degree to which the sample was representative of the larger population of building owners and therefore a simple test was conceived to determine whether the data set was representative. Suspecting that these ownerships were not representative of the larger sample of building owners, the consultants obtained publicly available tax assessment and deed transfer information from the County Assessor. This data was entered into a computer and sorted by date of purchase; the resulting comparison of purchase dates in the data set and in the Assessor's information clearly indicated a very poor fit between the sample obtained from the questionnaires and the deed transfers recorded by the Assessor. **The unfortunate conclusion of this exercise was that the information obtained from building owners was skewed substantially towards owners with a long term interest in their buildings. This bias explained the unexpected result that nearly 50% of the reporting owners held their buildings without debt. If this represented City-wide conditions, the publicly argued financial problems ordinance opponents have anticipated with upgrading would not have been documented by the data. However, given the poor fit between the sample data and actual conditions, it was impossible to derive representative conclusions from the questionnaire data directly.**

With this unfortunate result, the remaining information in the economic questionnaire was analyzed to see if some alternative method could be devised to estimate the affordability of a strengthening program for all building owners in the City. By plotting the relationship between tax liability and date of purchase for the detailed data obtained from the property owner questionnaire, an indirect measure was generated of the extent to which an owner had equity in a building. Based on this method of estimation and using nearly the entire sample of buildings contained in the Assessor's records, a summary table was prepared which displays the date of the most recent deed transfers for all the buildings in the inventory. Cross referencing this table with the confidential data obtained from building owners, a rough estimate of the affordability of a mandatory upgrade for building owners was obtained. **Based on this analysis, it appears about 39% of the inventory is currently owned either free and clear or with only minimal debt (equivalent to ownerships with tax liabilities under $1000). On the other hand, about 49% of the buildings in the downtown area have very low equity in relation to debt; for these ownerships, borrowing additional money to fund upgrades would be difficult (unless other assets were available to the owner) and, presumably in some cases, impossible. Another 20% of the building owners fall between these two extremes. Because of this wide divergence in individual owner economics, it would be very difficult (if not impossible) to derive an economically non-disruptive (or minimally disruptive) program which could equitably be applied to all ownerships.** The ranking of building owners on the ability to pay and requiring more successful owners to fund their upgrades (while exempting less wealthy owners) would be of questionable constitutionality. It is interesting to note that nearly 50% of the buildings in the inventory have been purchased in the past 7 years. Since 1988, a surprisingly large percentage of the buildings in the inventory have been purchased by new owners; these changes may reflect the loss of major tax benefits that resulted from the 1987 Tax Reform Act. **Despite the relative crudeness of this analysis, it is evident that adoption of a mandatory strengthening program with relatively high implementation costs may create considerable hardship for as many as 50% of the downtown building owners and adverse effects on business tenants.**

2.7 Impacts of Construction on Tenants: Would Adoption of A Level III Ordinance be Economically Disruptive?

There are many types of construction impacts associated with strengthening unreinforced buildings. Due to the wide variations in disruptions resulting from different levels of upgrading, it is not possible to quantify specifically the number of businesses or residents that would be inconvenienced by each type of potential construction impact for each level of strengthening. However, it is possible to describe the general range of impacts resulting from each level of strengthening and to identify the types of businesses or residents likely to have the most difficulty during the retrofitting construction period.

A summary table was prepared which presents the range of disturbances associated with each of the various strengthening options (**Table 2-1**). This table displays the average costs per square foot, estimated project duration, duration with continued occupancy, level of interference with business activity, cost premiums for buildings occupied during construction, and average costs for upgrades with continued occupancy. Data in the table was derived primarily from Rutherford and Chekene's analysis of San Francisco building upgrade costs.

Based on the information contained in this table, it is clear that the Level I and II upgrades both have relatively small cost increases if tenants remain during construction whereas the Level III option can be quite disruptive and time consuming. Based on the analysis presented in the EIR, the consultants determined that a Level III upgrade would be very disruptive of business tenants. This upgrade is best performed during a change of occupancy or at some point in time when business activities can be suspended for several months.

Specific impacts include:

- **loss of income for tenants resulting from business suspension;**
- **serious interference with business activities during construction; and**
- **potential loss of rental income for building owners from businesses that decide to permanently relocate rather than vacate and reoccupy a building.**

To a considerable degree, these adverse effects are unavoidable with a **Level III** upgrade. Offsets can be provided such as rent suspension, financial supplements during business closure, and provision of temporary locations for business operations but all of these offsets would be relatively costly both for business owners and tenants. **Adoption of a Level I or II standard would minimize both tenant and business disruptions.**

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TABLE 2-1

AVERAGE CONSTRUCTION COSTS, PROJECT DURATION, AND TENANT DISTURBANCES

Strengthening Level	Average Costs per Square Foot	Project Duration	Project Duration with Continued Occupancy	Interference with/ Temporary Relocation of/ or Suspension of Business Required	Percent Increase in Costs if Building is Occupied During Construction	Average per Square Foot costs with Continued Occupancy
Level I	$4.80	4 to 7 weeks	6 to 9 weeks	Rarely Required for more than 10 days	40%	$6.72
Level II	$6.58	7 to 12 weeks	12 to 15 weeks	Sometimes Required for Several Weeks	40%	$9.21
Level III	$10.54-$14.00	6 to 20 weeks	12 to 40 weeks	Often Required for up to a 2 Month Period	20 to 100%	$12.65-28.00
Level IV	$30.00	8 to 32 weeks	16 to 60 weeks	Nearly Always Required	70 to 100%	$60.00

Note: Cost premiums during construction are considered worst case estimates. In application, average cost premiums for Level III construction in Ventura would probably range from 30 to 50% Cost increases implementing Level III programs are highly variable depending on the type of business occupying a building. The largest increases (80 to 100%) are nearly always associated with residential buildings. More typically, cost premiums for retail buildings range from 30 to 40%.

Source: Rutherford and Chekene

Several upgrades have recently been completed or are currently in process in Ventura. In response to comments on the EIR, interviews were conducted with business tenants currently experiencing (or with recent experience in) upgrade programs. The owners of **Frankys Place** (William and Kris Haldane), a business occupying a building currently being upgraded to **Level II** standards, indicated that the upgrade program has resulted in very considerable disruption to business activities and loss of revenues. Walk-in pedestrian traffic was seriously diminished by the extensive sidewalk scaffolding on the front of the building. Revenue losses were estimated to by about 30% over a fifteen week period. The business decline effected the wages of 18 employees. The owners, in retrospect, indicated that the business should have been closed more frequently to minimize costs during construction. The upgrade program itself only required business closure for one day. After completion of the upgrade, business volumes returned to pre-upgrade conditions. The owners also indicated that nearly continuous difficulties were experienced with the contractors performing the work; neither the building owner nor the contractor provided information about work schedules, activities, and related matters which would have assisted the tenants in deciding whether to remain open or not on a day by day basis.

These business owners made the following suggestions about how to minimize the effects of construction:

- o **provide a system of fines or penalties for the contractors if the construction goes on longer than planned, and**

- o **the City should provide a construction liaison to coordinate complaints and to enforce some form of scheduling between the tenant, the building owner, and the contractor;**

The owner of **Rains Shoes** (Ron Maxey) indicated that construction scaffolding and upgrade work continued for a period of nearly 90 days during which time pedestrian traffic was disrupted and building signage was covered. The owner observed that older people, in particular, had difficulty using the store during the upgrade. From initial work through completion, the period of construction disturbance was over one year due to changes in the implementation of the upgrade. Several plan changes extended the upgrade period considerably. The business did not have to close but revenues declined by about 35%. Since the interview was conducted just one week after completion of the upgrade, business activity had not yet recovered. Contacts with the construction contractor were minimal and not sufficient to enable daily or weekly business planned. This tenant suggested that the City consider the following measure:

- o **a streamlined process for approving plan modifications should be established to minimize disruptions in buildings where plan changes are necessary.**

The **Marquez Barbershop** in the 1903 Building, like the other owners interviewed, indicated that construction disruption extended over about a three month period. As in the case of other tenants, the business remained open but a significant loss of revenue resulted; this tenant estimated business losses to be about 40% of pre-construction revenues. Specific disruptions included: construction activities permitted the use of only a portion of the leased space during the upgrade; business losses resulted from the front entry scaffolding placement and inconvenience to pedestrians; bothersome levels of noise and some hazards due to falling interior concrete and wall surfaces. Relationships with the contractors (BMP Construction) were generally cooperative. The contractor made considerable efforts to minimize disruption which lessened the sense of inconvenience and disruption experienced by the tenant. This owner recommended the following mitigation measures to minimize construction effects:

- o **prior to initiation of construction, a schedule of activities should be drawn up and the tenant and contractor should coordinate regularly regarding planned activities;**

- **dumpsters should only be permitted out of the flow of business and pedestrian traffic (either to the rear or on the side of building not exposed to pedestrian movements);**

- **a pre-construction conference should be held between the contractor, the tenant, and the workers actually performing the upgrading; and**

- **all construction barriers should be planned to keep the building entrance and signage visible.**

Based on the interviews conducted in three cities (Ojai, Santa Barbara, San Francisco) concerning the disruptions that resulted from various types of strengthening programs, it is evident that **Level III** strengthening would be very disruptive to occupants remaining in a building. **Level II** upgrades were also disruptive; in Ventura, business tenants experienced a 30% to 40% revenue loss during the upgrade process. The duration of the upgrading programs were, on the average, about three months. These data confirmed the information obtained from other cities in southern California. Numerous suggestions were made by tenants which could significantly reduce tenant disruptions if a **Level I or II** standard is adopted. These recommendations have been incorporated into the recommended mitigation measures.

2.8 Adoption of the Proposed Ordinance and the Potential for Demolition of the Present Building Stock

One of the major issues of public concern raised in response to comments on the Draft EIR concerned the potential for demolition if the required upgrades are so extensive that strengthening becomes uneconomical. This is a serious and valid concern. However, the potential for demolition needs to be put into perspective against the background rate of demolition currently occurring in the City without an ordinance. To gain some perspective on the rate of demolition in the City without an ordinance in place, the number and location of unreinforced buildings demolished during the past 20 years was compiled. During this period, a total of 27 unreinforced buildings have been demolished in the City. This rate of removal is relatively high (20% of the current building stock); most of these demolitions are attributable to redevelopment efforts. This rate of demolition reflects the intensive urban renewal activity characteristic of the past two decades. Currently, neither Federal or State funding nor political conditions which made intensive redevelopment efforts possible in the past 20 years exist in the City. Therefore, this pattern is unlikely to continue and therefore the City's demolition rate is likely to change in the future to a lessor rate. The rate of demolition attributable to adoption of an ordinance in southern California cities is variable and ranges from a low of about 1% of the inventory (in about a 20 year period) to more than 26% (Alesch and Petak 1986:209). The upper end of this range is attributable generally to large scale redevelopment efforts.

With reasonable standards of reinforcement (such as were adopted by Los Angeles), the demolition rate in most cities is low, in the 1 to 2% range. Although the background demolition rate in Ventura has been substantially higher than the rate in major cities that have adopted an ordinance, it is likely this rate will not be replicated in the future. **The gradual removal through demolition of the unreinforced building stock in Ventura is an ongoing trend; the adoption of an ordinance would not accelerate this trend. The existing rate of demolition is likely to be reduced in the future even if the City adopts a Level III program. Adoption of a Level I or II program would produce little if any net change in the current demolition rate.**

Inclusion of a "like for like" replacement option in any ordinance proposal would contribute to making an ordinance more acceptable to the property holders who own the unreinforced building stock. The "like for like" replacement option potentially increases the value of an unreinforced building and provides an owner with the opportunity to decide what course of action is proper given the many variables that need to be contemplated in deciding how to dispose of a building located in a City which requires a relatively stringent strengthening program. **However, inclusion of this option in an ordinance may increase the rate of demolition since this option would, for some owners, become economically a more favorable decision than retaining an existing building.**

Because even upgraded buildings have the potential to fail to a certain degree (perhaps even radically if an earthquake is sufficiently strong), the advisability of spending $20.00 to $30.00 per square foot for upgrades may be questionable. **The "like for like" replacement option at least provides the property owner with an opportunity to judge and decide how to dispose of, reconstruct, or replace an unreinforced building.** The more stringent the upgrade requirement, the more likely that selective demolitions would occur. For this reason, the consultant determined that a comprehensive and extensive upgrade ordinance (**Level III or greater**) would potentially contribute to the current trends which are reducing the unreinforced building stock in the City. It is also important to stress that in cities that have adopted strengthening programs, the pace of demolition has not varied significantly from demolition rates prior to the adoption of strengthening requirements (Alesch and Petak 1986). **Therefore, considering all of these concerns and sources of evidence, the consultant determined that adverse effects of ordinance adoption on the streetscape would not be significant.**

2.9 The Seismic Risk Model: Predicting Improvement in Life Loss and Building Damage with Upgrading

Building damage and life loss was estimated using a computerized Seismic Risk Model (SRM) that considered both shaking intensity and the damage characteristics associated with each building in the Ventura inventory. Several earthquakes were modelled including a movement on the San Andreas and the Pitas Point-Ventura fault. The extent to which buildings might be damaged during a typical seismic event was estimated considering the building characteristics and other specific attributes contained in the database.

For the Ventura model, relationships were developed between building damage and predicted casualties as well as building damage and loss of building use. Casualties were estimated considering both building occupants and sidewalk pedestrians. Based on the results of the study, it was clear that a **Level I** upgrade would provide substantial protection for movement on the San Andreas but very little protection if an earthquake occurs on the Pitas Point-Ventura Fault. However, the latter event is considered a low probability occurrence. Only a **Level III** upgrade provides relatively comprehensive assurance that life loss and building damage would be minimized taking into consideration all possible types of future quakes.

A summary of the improvements in life loss and building damage associated with each level of strengthening are provided in Tables 2-2 and 2-3.

TABLE 2-2
THE NO PROJECT OPTION: PROBABLE CONSEQUENCES WITHOUT STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	3	10	5	27,918
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	21	85	62	339,012
Possible Consequence within 30 Years	4	15	25	133,680

TABLE 2-3
PROBABLE CONSEQUENCES WITH LEVEL I STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	1	2	None	1,817
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	14	57	25	138,825
Possible Consequence within 30 Years	2	6	6	34,740

TABLE 2-4

PROBABLE CONSEQUENCES WITH LEVEL II STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	None	1	None	Less than 500 square feet
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	8	31	12	64,887
Possible Consequence within 30 Years	1	None	3	16,320

TABLE 2-5

PROBABLE CONSEQUENCES WITH LEVEL III STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	None	None	None	Less than 200 square feet
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	1	7	3	59,262
Possible Consequence within 30 Years	None	None	1	5,520

2.10 The Historic Record of Earthquakes in Ventura

Several individuals commenting on the Draft EIR requested a review of the history of fault movements in Ventura. Summarizing this history of these movements is of limited utility in predicting future events and such an undertaking is subject to a number of limitations. The most significant limitation is that the length of time that unreinforced buildings have existed in Ventura in relation to geologic time is miniscule and therefore **historic data, when geologic processes are the subject of study, have only weak relevance as predictors.** A second limitation is that Richter Magnitude data from fault significant movements prior to the early 1900s are virtually unavailable and can only be extrapolated. The technological absence of seismic movement measuring devices during much of the time when unreinforced buildings have existed in Ventura is an obvious limitation which needs to be taken into account in reviewing the accuracy and completeness of available historic data. The ground accelerations from earthquakes that have affected the downtown part of Ventura prior to 1910 cannot be determined accurately based on Richter magnitudes. The Modified Mercali Index (MMI), an ordinal scale based on qualitative judgements (but limited to local ground acceleration estimates), is the more proper scale for assessing the strength of historic earthquakes which occurred prior to the development of the Richter scale but no systematic MMI scale review of earthquakes effecting Ventura is available.

In comments on the Draft EIR, some individuals commented that the historic record of earthquakes in Ventura could provide important information about how the City's unreinforced building stock would perform in the future. The underlying question that these commentors wanted addressed was: have prior earthquake experiences affected Ventura as significantly as the predicted level of damage, injury, and fatality calculated by the Seismic Risk Model? Put even more simply, these commentors asserted that since the unreinforced buildings performed adequately during prior earthquakes in Ventura, why should any reinforcement be required at this time?

These questions are actually not relevant for this reason: the last comparable movement to what is predicted (in the Seismic Risk Model) on the San Andreas occurred in 1852 prior to the construction of most of the unreinforced buildings in downtown Ventura. Based on anecdotal data contained in historic references, a number of adobes in Santa Barbara and Ventura were damaged in this earthquake but, other than this anecdotal information from historic accounts, little else can be stated with certainty about the history of damage, death, and injury associated with strong movements on the San Andreas. The recurrence interval for strong movements along the southern portion of the San Andreas is about 100 years (a rough estimate) and the probability for a movement to occur in the near future which is comparable to the 1852 quake is 30% in the next 30 years, a high probability in earthquake prediction modelling.

The probability of occurrence for a moderately strong to severe quake along other less active faults in the region is lower than the event projected for the San Andreas and the recurrence interval for significant movement on these faults is rather lengthy. Comparable historic data cannot be obtained since prior movements on the Pitas Point-Ventura fault have not occurred historically.

Several hundred years, in geologic time, is obviously a very brief time span. That destructive earthquakes have not yet come to pass in downtown Ventura is not a cogent argument for declining consideration of a strengthening standard. Prior to the Loma Prieta, exactly the same logic was applied to buildings in the Watsonville-Santa Cruz area which now, since the Loma Prieta quake, have been demolished.

In summary, the historic record of earthquakes which have occurred in Ventura is very brief, so brief in fact, that even the last recorded major movement along the San Andreas occurred prior to the construction of the unreinforced masonry buildings in Ventura. Given the calculated recurrence interval for an event on the Pitas Point-Ventura fault, it is probable that the prior significant movement on this fault (comparable to the maximum credible earthquake) occurred in prehistoric time. Given the slow manifestation of geologic phenomenon, historic experiences, when used to predict future conditions, do not provide accurate predictions of risk. Despite the apparent limitations of historic data, a complete history of

fault movements along both fault sources was compiled and is included in the EIR Technical Appendix. **What the history of both of these faults indicates is that both faults are active, slipping, and capable of substantially greater movement than what has been recorded historically.**

2.11 The Loma Prieta Quake as a Predictor: Similarities Between This Earthquake and Predicted Future Quakes in Ventura

In addition to the Seismic Risk Model described in chapter 7, another source of valuable information about how the City of Ventura's inventory of unreinforced buildings may respond to a strong earthquake was provided by comparative data generated as a result of studies done subsequent to the 1989 Loma Prieta Earthquake. The Loma Prieta Earthquake and its subsequent aftershocks resulted in widespread damage to a variety of commercial structures. A large geographical area was affected, as is typical for an earthquake of this magnitude. The affected area encompasses eight counties from Monterey and San Benito in the south to San Francisco, Alameda, and Contra Costa in the north. In total, building structures experienced damage over an area of approximately 3,000 square miles.

The severity of the social and economic problems that resulted from the quake were acute. Due to its similarity to conditions in Ventura, the city of Watsonville was selected as the model for projecting future impacts on Ventura. Using this model, the following adverse consequences were predicted:

- **The establishment of homeless encampments in public parks;**
- **The closure of contiguous blocks of central retail area;**
- **The displacement of tenants and the relocation of commercial tenants, to outlying, newer commercial areas;**
- **The establishment of relief centers;**
- **Continuous traffic congestion related to street closures and disruption of through traffic and downtown circulation; and**
- **The demolition of a large number of structures.**

Comments on the Draft EIR questioned the comparability of the Loma Prieta quake and events predicted for Ventura. Some commentors questioned the applicability of the data collected in Watsonville, Salinas, Santa Cruz, and Hollister to conditions in Ventura. The composition of the building inventory in Ventura and conditions in these other cities are broadly comparable; the structures are similar in age, building configuration, and inventory size. Soil amplification problems were particularly acute in Santa Cruz and less significant in Watsonville; for this reason, more emphasis was placed on collecting comparative data from Watsonville since amplification conditions in Watsonville more closely resemble what is expected in Ventura. The socio-economic and business conditions in Watsonville were also similar to conditions in Ventura.

The Richter Magnitude of the Loma Prieta was less than the magnitude of the 1857 San Andreas earthquake and less than the projected earthquake on the Pitas Point-Ventura that was simulated in the Seismic Risk Model. Therefore, compared to both historic San Andreas earthquakes and projected future worst case conditions, the Loma Prieta earthquake was a less intense earthquake than prior historic earthquakes on the San Andreas and the model conditions predicted in chapter 7.

However, Richter Magnitudes are not the only consideration that need to be weighed in determining the suitability of the Loma Prieta as a model for future conditions in Ventura if a moderate to strong quake occurs. Because there are many levels of ground shaking generated locally by an earthquake, the MMI scale is an appropriate measure of shaking intensity. In addition, ground accelerations alone are also not suitable

predictors of building damage since the duration of shaking (rather than maximum acceleration) often is a more significant determinant of damage than acceleration alone. Keeping all of these caveats in mind, it is possible to judge the degree of similarity of the Loma Prieta to future quakes in Ventura. John Kariotis, who provided the original **Level I and II** ordinance proposals for the City, specifically addressed the issue of the comparability of the Loma Prieta and future movements in Ventura. Based on this engineering review, **it is clear that the range of ground accelerations predicted for Ventura are within or less than the range of accelerations recorded for Loma Prieta**. Therefore, **based on comparability of Richter Magnitudes and ground accelerations documented by Kariotis, it is reasonable to conclude the experiences of Watsonville and Santa Cruz are directly comparable to future conditions modelled for Ventura.**

2.12 Comparing the Risks of Death from an Earthquake in Ventura with Other Typical Fatality Hazards

One of the commonly raised comments on the Draft EIR was that no direct comparison of the risks of death from earthquakes which might occur in Ventura was made to risks associated with other common sources of death (injuries, illnesses, and accidents). In response to this request, the following data were assembled to put the potential hazards described by the model into the context of general death risk assessment. In response to this interest in risk comparisons, a set of fatality probability summaries were derived.

Data in the EIR documents that the expected death rate for deaths from earthquakes is 1.8 persons per 100,000 population in San Francisco. A similar probability of death computation expected to occur in Ventura during a single year is less than 1 person. **Based on comparative data provided in the EIR, the expected annual death rate from earthquakes in both Ventura and San Francisco is lower than the rate for most major illnesses, accidents, suicide, and homicide.** However, although the probability of occurrence of a death inducing earthquake in any single year is relatively low, in the year a major earthquake occurs, the death rate per 100,000 persons is anticipated to be considerably higher than the probability projection for any single year. In Ventura, single year fatalities during the year of a major earthquake would be about 14 persons.

Other comparisons were made in the EIR; one set of tables compared the risk of death from an earthquake to the probability of dying from an accidental sports injury. Earthquake death risks for San Francisco are approximately equivalent to the annual rate of death for professional football players (assuming 100,000 football players are active in any single year). **The death rate per 100,000 persons in Ventura expected to occur as a result of an earthquake is less than all sources of sports accidents.**

Between 1971 and 1989, the number of deaths that have occurred from earthquakes during any single year ranged from a low of no deaths to a high of 62 persons in 1989. Averaging this death rate, an annual death rate for the United States can be derived (7 persons per year). This rate is about 1/10th the annual death rate resulting from hurricanes or tornadoes, the closest approximation of the earthquake death rate. <u>In a year that an earthquake occurs</u> (rather than an average annual probability), the total number of deaths would be about half the annual risk of death from hurricanes and tornadoes. Therefore, even in the year when a major earthquake occurs, the risk of death from earthquakes in the western United States is less than the annual rate of death for all other sources of commonly occurring accidental death including natural phenomenon such as tornadoes or hurricanes. Compared with every source of fatality event except deaths attributed to severe weather conditions, the annual risk of death from an earthquake fails to approach the risks associated with nearly all forms of accident and common forms of illness. **In summary, compared to other risk sources, the annual probability of dying in an earthquake in Ventura is properly characterized as remote.**

However, it is important to stress that these probabilities are sharply reversed in a year when an earthquake occurs. The reduced probability of death from an earthquake is related to the infrequency of earthquake occurrences (compared, for example, to annually occurring hurricanes or tornadoes, the two natural events that come closest to approximating the possibility of death from an earthquake). The reduced annual risk comparison can be misleading, particularly if an area is seismically active or if faults are proximal to

hazardous buildings. **Without question, in Ventura, the probability of death from collapsing building debris is higher than many of the accident types considered in the EIR, many of which do not constitute the risk profile of life in Ventura.**

Likewise, it is important to temper the comparison of risk with the sources of risk to which local residents are exposed. For example, a comparison of the annual risk of an earthquake related deaths from failure of non-ductile concrete, unreinforced masonry or tilt-up structures, when standardized by square footage, clearly indicates that the risk of death is higher for occupants or pedestrians in or near unreinforced masonry buildings. However, when the total number of fatalities is examined, it is clear, for example, that in the San Fernando-Sylmar earthquake, more fatalities resulted from failures in other types of structures rather than unreinforced masonry buildings. But the death sources in San Fernando-Sylmar reflect the composition of the building inventory; the Ventura downtown study area has only 19 potentially hazardous non-ductile concrete buildings and over 135 potentially hazardous unreinforced masonry buildings. No tilt-up buildings are present in the study area. **Therefore, based on the square footage of hazardous building types and the death rate associated with each type of structure, the only conclusion that can be drawn is that unreinforced masonry buildings are the most likely hazardous potentially death producing structures in the study area.** Likewise, although more than 60 deaths occurred as a result of the recent Loma Prieta, most of these deaths were attributed to a failure in a bridge facility. The only type of building that produced fatalities in this earthquake were unreinforced masonry structures.

The proposed ordinance may potentially alter two important aspects of community aesthetics in the Downtown vicinity and surrounding areas: the current visual quality of the streetscape may be modified if some form of strengthening ordinance is adopted and the cultural and architectural significance of some important structures may be altered, resulting in adverse consequences on the historic fabric and scenic quality of the streetscape, particularly in areas where the inventory of unreinforced structures is high. However, if no ordinance is adopted, it is likely that much of the historic unreinforced masonry building stock in the City would be seriously reduced by a moderate to strong quake. Moreover, if an ordinance is adopted that is not sufficiently protective, a significant number of structures could be lost as a result of post-earthquake demolitions. A third potential source of impact to cultural resources is related to the foundation structural work that may necessitate excavation into historic or prehistoric archaeological deposits to facilitate strengthening. Each of these sources of impact are considered in the EIR and a comprehensive set of mitigation measures were developed to address these concerns.

Nearly any level of upgrading will result in inconvenience and the typical disturbance of construction including noise, dust generation, pedestrian inconvenience and business interference. Strengthening activities per se do not create any substantially unique or a typical construction problems; however, the presence of tenants during this upgrading process contributes importantly to the uniqueness of upgrade construction problems. Construction in an urban setting is not an unusual occurrence, although the practice of complete renovation and restoration in a downtown setting is more familiar to residents of more intensely urban areas than cities such as Ventura. Safety, dust suppression and inconvenience reduction programs in densely populated, active urban areas with unreinforced buildings are familiar to most contractors with expertise in seismic upgrades.

In responses to the Notice-of-Preparation, several members of the public (including building owners) raised questions about the potential adverse consequences of upgrade construction activities on the downtown area and on business activities in particular. Where these concerns are applicable is primarily in the portion of the City between Figueroa and Chestnut along Main Street. Given the lack of contiguous structures and low pedestrian counts in other parts of the City where isolated unreinforced buildings are located, the problems related to upgrade construction in these areas would be similar to and typical of commercial or industrial renovations and, to a considerable extent, new construction in these areas. Therefore, the applicability of the discussion regarding construction effects primarily concerns that portion of the unreinforced building inventory in the Main Street corridor.

This discussion addresses known construction effects associated with the adoption of an ordinance. The mitigation measures presented in the conclusion of the chapter are probably equally applicable to any level of strengthening but, depending on the scope of the ordinance ultimately adapted, some measures may not be necessary. Before discussing specific construction effects, a review of prior experiences in other cities regarding construction impacts on tenants and business owners is provided to put into perspective the physical impacts resulting from upgrading. Comparative data from Ojai and Santa Barbara are used to illustrate the range of problems that strengthening programs create for owners and tenants. Impacts of the construction period on various types of tenants is discussed first. Mitigation measures were developed for all anticipated construction related effects.

2.13 Summary of EIR Findings and Identification of The Environmentally Superior Alternative

In summary, the EIR presents in considerable detail the range of physical, economic, and possible social environmental effects that the ordinance is designed to prevent from occurring in the event of a moderate to strong earthquake. The long and short term effects of a moderate to strong earthquake on the City of Ventura include but are not limited to the following substantial adverse effects:

- **loss of life;**
- **loss of retail and commercial buildings;**
- **destruction of personal property;**
- **damage to or loss of housing units;**
- **decline in or elimination of historic building stock;**
- **homelessness and lack of affordable housing;**
- **disruption to or elimination of income; and**
- **economic depression of the downtown core.**

The proposed project was conceived to minimize these adverse effects to the extent feasible within the realistic constraints generated by the physical and economic consequences that would be created if an ordinance were adopted. These predicted effects include:

- **construction effects (noise, dust nuisance, air quality effects, temporary parking, materials storage, and circulation problems);**
- **minimal disruption to the significance of the historic streetscape;**
- **reduction in building stock through gradual demolition of properties which owners decide not to upgrade;**
- **potential short term (and in some cases long term) economic hardship for some business owners, building owners, and low income renters.**

The degree of dislocation and potential hardship on building and business owners and tenants, the extent of modification to the historic fabric of the City, and the type and duration of physical impacts related to construction are directly related to the upgrading requirements that are ultimately adopted. In many instances, as discussed in the preceding chapters, the degree of impact associated with different ordinance options is more apparent in the economic sphere. Although economic effects differ substantially with

various ordinance options, the physical effects of any form of upgrade are very similar. Therefore, the alternatives analysis focused on the economic consequences of various options.

A review of important alternatives was provided in the EIR as well as a survey of most of the important strengthening activities that provide the basic engineering options that comprise these different approaches to the problem. Based on the data presented, it is clear that either a **Level III** or **IV** upgrade would be much more time consuming, complex, disruptive, and expensive to implement than a **Level I or II** upgrade. **Level I** or **II** strengthening is relatively simple compared to both **Level III** and **IV** programs. The construction duration, type of strengthening activities required, and extent of disruption to tenants differs substantially between the various alternatives. Although acceptable levels of disturbance (typical of remodel programs) are associated with **Level I** and **II** upgrades, **Level III** and **IV** strengthening generally will require vacating buildings, tenant relocation, and complex construction activities.

The City has considered eight alternative approaches to implementing an ordinance during the past several years; these eight alternatives are described fully in the Project Description. It is important to understand that these eight options are actually only based on **two** levels of strengthening--the **Level I and II** types of upgrades. Compared to statewide efforts to adopt strengthening programs, the City's **Level I** and **II** proposals are more restrictive than standards adopted by some cities but less restrictive than approaches adopted by other jurisdictions and promulgated by the state. The range of options being adopted statewide are presented in chapter 3.

In addition to the alternatives presented in the Project Description, other options considered in the alternatives analysis included:

- Option 1: No Project;
- Option 2: A Demolition Ordinance
- Option 3: The State Model Ordinance (a **Level III** program);
- Option 4: **Level I** strengthening only (without **Level II** additions);
- Option 5: **Level II** strengthening for all buildings;
- Option 6: A Multi-Level Ordinance (combining **Levels I, II, and III**).
- Option 7: The Economically and Environmentally Superior Option

In the Draft EIR, the consultants originally concluded that either a long term demolition ordinance or a multi-level ordinance would be superior to the options studied by the City thus far. In response to additional economic study and recent passage of AB 204, the consultants revised this recommendation.

The environmentally superior option is comprised of the following components:

(1) Adopt the Level III Standard into the Building Code

This action would incorporate the UCBC Appendix Chapter 1 into the City's building code. This **Level III** standard **would not** require mandatory strengthening on the part of any building owner; rather, this code adoption would merely set a design standard for effective life safety and building damage reduction that owners could comply with voluntarily on an individual basis as their financial condition permitted (e.g., sale of the building, major investment decision, etc). Given the recent passage of AB 204, this action becomes a requirement with mandatory

implementation in July 1993. The City would simply be complying with the new code requirements in advance of mandatory compliance.

Costs to the building owner: None

Impacts on tenants: None

(2) Adopt an Historic Buildings Provision

The ordinance should reference the 20 unreinforced buildings identified in the EIR that have sufficient architectural or historic merit to qualify for City assistance (to the degree that such assistance becomes available in the future). The ordinance should initiate the process of joint City-property owner upgrading and/or restoration of these buildings to a **Level III** standard. The City should consider pursing Mills Act contracts and related financial incentives to assist in implementing the voluntary upgrade of these buildings.

Costs for the building owner: None. Voluntary compliance.

Impacts on tenants: None until the upgrade is performed. Work should be performed during changes of tenancy.

(3) Create a Voluntary Building Replacement Incentive Program

Based on the consultant's economic analysis, some building owners may, if provided with substantial incentives, choose to demolish their buildings and replace the existing structures with new, mixed use buildings that would provide a greater financial return than current earnings. The incentives that the City could consider for owners who agree to demolish and replace their buildings include:

- "like for like" replacement of current square footage with generous modifications for mixed use buildings (retail and office with residential uses);
- reduction or elimination of building permit fees for replacement buildings;
- reduction of fees on additional construction of residential units above new commercial construction; and
- exempting a percent of new square footage (in addition to the replacement square footage) from fees if the new square footage is applied to mixed use buildings.

These and other incentives should be structured to meet the evolving objectives contained in the Downtown Specific Plan (in preparation).

Costs for the building owner: None

Impacts on tenants: None

(4) Require a Structural Analysis of Each Building

A provision should be adopted (similar to the structural analysis requirement in the Palo Alto ordinance) which requires an analysis to be filed with the City of the specific earthquake hazards associated with each unreinforced building. This report need not be overly detailed; the basic justification for this analysis would be to establish clear property owner liability for the existing hazardous conditions and to transfer this liability from the City to the owner.

Costs for the building owner: Variable but about $2,000 for a moderate sized building.

Impacts on tenants: None

(5) Adopt Mandatory Parapet Strengthening along Public Ways (streets and alleys) and Other Hazard Reducing Measures

A mandatory requirement for strengthening parapets along public ways (streets, alleys, parking lots) and over building entrance/exits should be required. This program would eliminate the single greatest source of risk to the public from these types of buildings. The City may also consider requiring shatterproof glazing on all open store fronts and other minor non-structural improvements that will reduce earthquake injury risks to pedestrians and building occupants.

Costs for the building owner: Variable, but estimates range from a low of about $20 to $75 per lineal foot. Realistic estimated costs would range from about $1.00 to $1.50 per square foot for a 5,000 square foot building. Assuming the front and rear parapets are strengthened on a typical 50 x 100 building, the total cost would range from about $2,000 to $7,500.

Impacts on tenants: Very minimal to none. Nearly all work is done on the roof and therefore little if any business interference would result. Businesses would not need to close and the pedestrian way would not be affected by the work.

This upgrade would not interfere with or create any confusion with the mandates of AB 204 since the current standard for parapet strengthening is contained in the UCBC Appendix Chapter 1.

2.14 Impact Summary and Mitigation Measures

Regardless of which upgrade option is adopted, some impacts are anticipated to cultural resources and to the City's streetscape in the downtown core where a large portion of unreinforced buildings are concentrated. **Table 2-6** presents a summary of anticipated impacts associated with various options and associated recommended mitigation measures. Construction impacts are expected to result in very minor adverse effects except on Main Street in the downtown area between approximately Figueroa and California where unreinforced building density is highest. To mitigate impacts associated with construction and cultural resource effects, the following measures are recommended:

Cultural Resource Mitigation Measures

To reduce impacts on cultural and visual resources to insignificance, the following mitigation measures are recommended:

(1) The City Historic Preservation Commission, based on the advice of the Building Official, shall prioritize designated City Landmarks and Structures of Merit as the building stock of historic structures to be preserved in the event of a moderate to strong earthquake. Engineering studies shall be performed on these structures (by the building owners with the assistance and cooperation of the City) to determine what modifications are necessary to enable the structures to withstand either the maximum credible earthquake for Ventura or an appropriate design quake selected by the City. The final protective design for these structures shall consider both the interior and exterior visual effects of various strengthening activities on the historic integrity of the buildings. The basic design objective should be biased towards preserving the historic integrity of the streetscape facades of these buildings rather than historic building interiors.

(2) All strengthening work on buildings of historic significance shall be performed in accord with a set of standards developed by the City to restore the exterior visual quality and detailing of these buildings. These standards should address:

- o building detailing,
- o brick repointing,
- o restoration of stone elements,
- o painting guidelines (brick painting should be prohibited),
- o use of historic wall anchor styles,
- o signage and awnings,
- o removal of stucco (unless such a surface was present on the original building)
- o other features determined significant by the Historic Preservation Commission.

(3) With the cooperation of property owners, the City shall establish an Historic District encompassing the boundary of all unreinforced masonry structures included in the Main Street Corridor. This district should be created to assist in designing and funding a comprehensive, unified solution to strengthening within this corridor. The District should be organized to utilize Marks Historic Bond Act funds, Mills Acts Contracts, and other resources to assist in upgrade efforts. Individual property owners should be required to pay a fair share of any future reconstruction activities within this corridor if a formal Assessment District is established to complement the Historic District Designation. At a minimum, properties within the proposed District should be afforded the opportunity to participate in Mills Contract programs to help defray the costs of upgrading.

Construction Effects

To reduce impacts from construction, the following mitigation measures are recommended:

Issue 1: Asbestos Remediation

(1) **If deemed warranted and at the City Building Official's discretion, prior to issuance of building permits for strengthening or demolition permits for building removal, an asbestos evaluation shall be performed by a qualified consultant to determine what asbestos is present and how the hazard is to be remedied. All asbestos remediation and disposal shall be performed in accordance with Federal, State, and City guidelines and policy.**

To mitigate adverse effects where a significant number of unreinforced buildings are concentrated in the Downtown Corridor, the following mitigation measures should be required:

Issue 2: Noise Inconvenience

(2) **To minimize noise effects, all stationary construction noise sources should be sheltered or enclosed to minimize effects. When feasible, generators and pneumatic compressors shall be placed in parking areas or behind buildings outside of public and business pedestrian traffic corridors. Flexible work hours (including evening and weekend construction) should be permitted only if nearby residential areas can be protected from noise sources. All construction shall comply with the City's Noise Ordinance.**

Issue 3: Dumpsters, Dust, Odors and Other Minor Inconveniences

(3) **All contractors involved in building strengthening shall provide a written dust suppression strategy to be submitted with building permit applications. Dumpsters, pre-assembly construction tasks, and materials storage shall be limited to defined, prescribed areas. Their materials storage and work areas shall be situated, to the degree feasible, behind rather than in front of buildings where upgrades are being done, or in parking lots adjacent to construction locations. Construction schedules shall be made available to adjacent building tenants. Dust covers and temporary building sheathing as well as other dust suppression methods shall be used when appropriate. Construction activities shall be coordinated with tenants and, to the degree physically feasible, the concerns of tenants shall be respected in all seismic upgrade construction planning.**

Issue 4: The Duration and Organization of Construction

(4) **If a Level III program is adopted, to minimize construction effects on the public, owners, tenants, and essential fire and police services providers, the City shall be partitioned into upgrade districts. Construction within the Downtown corridor should, to the extent feasible (unless a building owner decides to pursue a strengthening program prior to scheduled completion dates specified in the ordinance), occur only during the specified time frame in the ordinance. These districts should be one block long in size and construction should be sequenced taking into account the economic viability of businesses within each block. A district program would probably not be warranted if a Level I or II program is adopted.**

Issue 5: Construction Effects on Business Tenants

(5) To minimize construction effects on tenants, the City should appoint an upgrading liaison representative who would be responsible for implementing and monitoring compliance with a program to minimize construction effects on tenants. This program should be responsive to building tenants needs. Tenant participation in defining the scope of this program should be required. Recommended components of the program include:

- o if feasible and implementable, providing a system of fines or penalties for the contractors if the construction goes on longer than planned; this system of penalties would not involve the City directly but could take the form of a liquidated damages clause between owners and contractors;

- o the City should provide a construction liaison to coordinate complaints and to advise owners, tenants, and contractors about the need for consultation in construction scheduling between the tenant, the building owner, and the contractor;

- o a streamlined process for approving plan modifications should be established to minimize disruptions in buildings where plan changes are necessary;

- o prior to initiation of construction, a schedule of activities should be drawn up and the tenant and contractor should coordinate regularly regarding planned activities;

- o if feasible and implementable, dumpsters should only be permitted out of the flow of business and pedestrian traffic (either to the rear or on the side of building not exposed to pedestrian movements);

- o a pre-construction conference should be held between the contractor, the tenant, and the workers actually performing the upgrading; and

- o all construction barriers should be planned to keep the building entrance and signage visible.

Mitigation Scope and Residual Effects

The mitigation measures outlined above are designed to lessen the impact of construction on building tenants, the public, and individuals patronizing businesses in the Main Street corridor. Throughout the rest of the City, construction related impacts are anticipated to be of no project specific or cumulative significance. The implementation of the proposed measures would fully offset any potentially significant effects associated with upgrade construction.

SUMMARY OF IMPACTS AND MITIGATION MEASURES					
ISSUE: CULTURAL RESOURCES					
Impact	Mitigation Measures	Applicable to Upgrade Standard Level I	Level II	Level III	Residual Effects
In the event of a moderate to strong earthquake, important historic structures would be significantly damaged resulting in building demolition and alteration of the City's historic streetscape.	(1) Prioritize structures to be preserved.	No	Possibly	Yes	Not Significant
	(2) Perform engineering studies to define upgrade requirements.	No	Possibly	Yes	Not Significant
	(3) Determine protective standards on a case by case basis.	No	Possibly	Yes	Not Significant
Loss of historic character and diminishment of visual quality of the streetscape may result from poorly executed reinforcement programs.	(1) Develop a set of aesthetic and architectural guidelines to address brick detailing, repointing, restoration of stone elements, painting guidelines, signage and awnings, removal of stucco, and other features.	Possibly (wall anchor styles only)	Possibly (selected elements of the guidelines)	Yes	Not Significant
Earthquake effects on the main street corridor could potentially result in considerable change to the building stock and historic character of the downtown core.	(1) Establish an historic district to assist in obtaining funds for strengthening work.	No	No	Yes	Not Significant
	(2) Initiate Mills Act contracts for selected properties.	No	No	Yes	Not Significant

SUMMARY OF IMPACTS AND MITIGATION MEASURES					
ISSUE: CONSTRUCTION EFFECTS					
Impact	Mitigation Measures	Applicable to Upgrade Standard Level I	Level II	Level III	Residual Effects
Releases of asbestos may result during construction work required for upgrading.	(1) Conduct an asbestos evaluation.	Possibly	Possibly	Yes	Not Significant
	(2) Perform remediation as necessary.	Doubtful	Doubtful	Possible	Not Significant
Strengthening activities will result in periodic noise inconvenience to tenants and surrounding building occupants.	(1) Shelter all stationary noise sources. Place generators and compressors in parking areas behind buildings outside of pedestrian corridors. Permit flexible work hours only if residential tenants are not disrupted.	Yes	Yes	Yes	Not Significant
Demolition, materials storage, odors and other disruptions and inconveniences would adversely impact building tenants and surrounding properties.	(1) Contractors should prepare written dust suppression plans.	Possibly	Yes	Yes	Not Significant
	(2) Materials storage, dumpsters, and pre-assembly tasks should be limited to prescribed areas.	Yes	Yes	Yes	Not Significant
	(3) Situate dumpsters and other materials behind buildings and out of pedestrian ways.	Yes	Yes	Yes	Not Significant
	(4) Use dust covers and building sheathing when necessary.	No	Possibly	Yes	Not Significant
	(5) Coordinate construction activities with tenants.	Yes	Yes	Yes	Not Significant

SUMMARY OF IMPACTS AND MITIGATION MEASURES					
ISSUE: CONSTRUCTION EFFECTS					
Impact	Mitigation Measures	Applicable to Upgrade Standard Level I	Level II	Level III	Residual Effects
The duration of construction for a Level III program would impact the public, owners, tenants, and essential fire and police services. Long term disruption could be prolonged and disruptive to business activies and downtown viability.	(1) Establish a series of construction districts and require coordinated strengthening within each district. Districts should be about one block long.	No	No	Yes	Not Significant
Construction effects on tenants would result in temporary closures, business disruptions, loss of income, and other economic disruptions.	(1) The City should appoint an upgrading liaison representative for monitoring construction effects on tenants.	No	Yes	Yes	Not Significant
	(2) Provide a system of fines or penalties for delayed construction.	No	Possibly	Yes	Not Significant
	(3) Streamline system for plan modifications.	Possibly	Yes	Yes	Not Significant
	(4) Encourage tenant-contractor schedule consultation.	Yes	Yes	Yes	Not Significant
	(5) Maintain open access to businesses, hold a pre-construction conference, and provide temporary signage as necessary.	No	Yes	Yes	Not Significant

SUMMARY OF THE ENVIRONMENTALLY SUPERIOR PROJECT			
Recommended Action	Costs of the Building Owner	Impacts on Tenants	Effects on Current City Upgrade Actions
Adopt the Level III (UCBC Appendix Chapter 1) into the City's Building Code. This action would not require mandatory strengthening. This requirement becomes law in July of 1993.	None until upgrades are implemented	None until upgrades are implemented	This action would replace the existing Level I and II standards with the uniform, more effective Level III standard.
Adopt an Historic Buildings Provision which would identify buildings that would merit City assistance for upgrading. City support should be limited to Level III upgrades.	None	None until work is performed	This measure would identify a core stock of historic buildings that would be upgraded to standards that would assure preservation if a moderate to strong earthquake occurs.
Create a voluntary building replacement incentive program comprised of like for like replacement, reduction or elimination of building permit and parking fees, reduction of fees for construction of residential units situated above replacement commercial square footage, and related incentives.	None	None	This program would encourage the gradual replacement of some of the unreinforced building stock with new, mixed use (commercial/residential) structures.
Require a Structural Analysis of each building (similar to the Palo Alto Ordinance) which requires an analysis of earthquake hazards for individual buildings.	About $2,000 depending on building size	None	This action would clearly identify the hazardous nature of each building and remedies to increase building safety.
Adopt mandatory parapet strengthening along public ways and other hazard reducing measures including but not limited to: requiring shatterproof window glazing, evaluating critical adjacency problems and anchoring specific walls as required, and other measures.	$2,000 to $7,500 for public way parapet strengthening	Minimal disruptions to tenants	This program is less intensive than a Level I option and would serve as an interim measure pending building code changes.

CHAPTER 3

PROJECT DESCRIPTION

Modifications to the Final EIR in Response to Comments on the Draft

Comments from the public on the Draft EIR regarding the Project Description were directed primarily to requesting clarification of what buildings would be affected by ordinance adoption. The Draft EIR included a table in the Project Description which listed all of the structures included in the original inventory prepared for submittal to the State; this table, which was partitioned into occupancy types, has now been deleted from this chapter and is instead included in the EIR Technical Appendix. In the Final EIR, a simplified table has been provided which lists all structures subject to the ordinance (which is a subset of the buildings included in the original inventory submitted to the State).

The other important modifications to this chapter pertains to recent developments in State legislation that have created some confusion about the prudence of adopting a partial strengthening standard (rather than the **Level III** program commonly referred to as the State Model Ordinance). These developments are described in Section 3.2 of this chapter. This recently adopted legislation will require local jurisdictions to adopt the UCBC Appendix Chapter 1 as the building code for unreinforced masonry buildings if a mandatory strengthening program is required. This change in the code becomes fully effective in July, 1993.

3.1 Introduction

The Project Description for the Unreinforced Masonry EIR is comprised of the following sections:

3.2 **Background to the Project** - a legal introduction to the problem and a synopsis of the City's efforts to date to adopt an ordinance;

3.3 **Definition of Terms** - a formal definition of unreinforced masonry structural materials and building types subject to the ordinance;

3.4 **Inventory of Unreinforced Masonry Buildings** - a synopsis of the City's inventory of buildings subject to the proposed ordinance;

3.5 **Ordinance Options** - a review and summary of ordinance options that have been considered by the City to the present;

3.6 **Project Phasing** - a review of project phasing options and implementation schedule;

3.7 **Project synopsis and a General Introduction to Ordinance Alternatives** - a summary of the project and several other ordinance options discussed in the EIR.

Because this is primarily a policy EIR, the conventional format for Project Description presentation has been modified considerably. This Project Description is designed to familiarize the public and the decision-makers with the range of ordinance options considered by the City and to enable a reasonably educated evaluation of these alternatives. Although specific ordinance language comprises the project description, the information presented in the EIR is sufficiently detailed that any combination of options could be formalized into a proposed ordinance. The conclusion of the Alternatives analysis in Chapter 12 presents the advantages and disadvantages of different upgrade requirements. In addition to the two levels of strengthening configured into eight different ordinance options previously considered by the City, other alternatives and more intensive approaches to strengthening are considered in the EIR. In the Draft EIR, the consultants recommended adoption either of a demolition ordinance or of a multi-level ordinance option that requires different levels of upgrade for different types of buildings. In the Final EIR, this

recommendation has been modified to take into account the economic and tenant effect data collected between the publication of the Draft and completion of the Final. Rather than recommending a specific course of action, the Alternatives chapter has been rewritten to provide the decision-makers with a clear presentation of the merits and problems of each option. As required by CEQA, an environmentally superior option has been identified but this option does not take into account the fiscal and economic data discussed in chapter 11. In addition to the presentation of options in this chapter and in the Alternatives analysis, several other upgrading alternatives are discussed in Chapter 5 (The Engineering Problem and Alternative Solutions) and in the Technical Appendix.

Unlike many EIRs, **the subject of this document is a relatively rare and infrequent event - a moderate or larger sized earthquake,** and the response of unreinforced masonry buildings to such quakes. A worst case evaluation, a major movement along the Pitas Point-Ventura Fault, is considered in this EIR as well as less consequential potential earthquake events such as a movement on the San Andreas. This subject is relatively complex compared to most policy decisions because the geological sciences relevant to earthquake prediction are imprecise and probabilistic.

Engineering design judgements are also inexact and considerably debated. There is no clear, easily interpreted solution to the problem of earthquakes and their effects on unreinforced structures. This lack of unanimity regarding an advisable course of action that is subject to professional consensus is frustrating but nonetheless the reality of the situation. Disagreement among experts in the fields of geology and engineering seismology regarding unreinforced masonry buildings is encountered in the academic literature, at professional meetings, and in the presentation of conflicting recommendations about how to assure reasonable life safety and building damage reduction given a moderate to strong earthquake. The consultant has attempted to report the reasonable disagreements that exist which are pertinent to the EIR. Nonetheless, recommendations about a course of action for the City regarding this subject are presented throughout the document.

3.2 Background to the Project

Legal Background

Because unreinforced masonry buildings frequently partially fail or collapse completely in moderate to strong earthquakes, they pose a substantial hazard to life safety and can cause severe economic disruption to a downtown business community. As a result of the Long Beach earthquake in 1933 where 1,390 unreinforced buildings were damaged and approximately 100 people died, the State Earthquake Protection Law (Riley Act) was enacted to assure that buildings would be designed to withstand lateral forces and to minimize building collapses. Since that time, the experiences of the 1971 San Fernando earthquake, the 1983 Coalinga earthquake, the 1987 Whittier earthquake and the 1989 Loma Prieta earthquake, have again illustrated the hazardous conditions engendered by these types of structures. There are other types of existing buildings that do not meet current earthquake standards in building codes, but it is widely recognized that unreinforced masonry buildings are one of the most common building types subject to serious failures that have life safety consequences.

The City of Los Angeles adopted a comprehensive mandatory unreinforced building upgrade ordinance in 1981 which was intended to reduce the risk of death and injury from unreinforced bearing wall buildings constructed prior to 1934. **The Los Angeles ordinance assumed that it would not be feasible to require upgrading to current code standards; instead, special requirements unique to masonry buildings that reduce seismic hazards and provided life safety were proposed.**

In 1986, the California State Senate passed Senate Bill 547 (Alquist) which was codified into the Government Code as Chapter 12.2, Section 8875, Division 1 of Title 2. This bill and implementing law requires that:

> *"The State Seismic Safety Commission initiate a program of identifying potentially hazardous buildings by requiring local building departments of Cities and Counties by January 1, 1990, identify all those buildings within their jurisdiction, establish a mitigation program, as specified, and report to the Commission......The bill requires the Commission to prepare an advisory report for local jurisdictions containing criteria and procedures, as specified, by September 1, 1987."*

The Bill specifically identifies unreinforced masonry buildings as primary building types of concern. Section 1(c) of the bill states:

> *"The Legislature additionally finds that the Seismic Safety Commission estimates that there may be more than 60,000 unreinforced masonry buildings constructed before 1933 which remain in use in this State. As part of an effort to protect the public health and safety, the Legislature declares the need to establish programs in the seismically active areas of the State to identify potentially hazardous buildings within local governmental jurisdictions."*

The definitions incorporated into Division 1 Title 2 of the Government Code (Section 8875 [a]) state:

> *"Potentially hazardous building means any building constructed prior to the adoption of local building codes requiring earthquake resistant design of buildings and constructed of unreinforced masonry wall construction. Potentially hazardous buildings include all buildings of this type, including, but not limited to, public and private schools, theaters, places of public assembly, apartment buildings, hotels, motels, fire stations, police stations, and buildings housing emergency services, equipment, or supplies, such as government buildings, disaster relief centers, communications facilities, hospitals, blood banks, pharmaceutical supply warehouses, plants, and retail outlets. Potentially hazardous building <u>does not include</u> warehouses or similar structures not used for human habitation, except for warehouses or structures housing emergency services equipment or supplies. Potentially hazardous building <u>does not include</u> any building having five living units or less. Potentially hazardous building does not include, for purposes of subdivision (a) Section 8875, any building which qualifies as "historical property" as determined by an appropriate governmental agency under Section 37602 of the Health and Safety Code (emphasis added)."*

Interpreting these definitions, certain exclusions were provided to the scope of any ordinance. **Exclusions include:**

(1) Warehouses and similar structures not used for habitation (except such structures housing emergency equipment or supplies);

(2) Buildings with five (5) or fewer residential units;

(3) Any building that qualifies as a historical property as defined in Section 37602 of the Health and Safety Code.

The exclusion attached to historical buildings is rather narrow and encompasses the <u>inventory requirement only</u>. Historic structures exempt from inventory requirement are specified in the Health and Safety code as:

> *"Any building or part thereof, object, structure, monument, or collection thereof deemed of importance to the history, architecture, or culture of an area as determined by an appropriate*

governmental agency. An appropriate governmental agency is a local official historic preservation Board or Commission, a legislative body of a local agency, or the State Historical Resources Commission. "Historical property" includes objects, buildings, structures, monuments, or collections thereof on existing national, State or local historical registers or official inventories, such as the National Register of Historic Places and State Historical Landmarks."

The law directs local agencies to accomplish two objectives:

> "Identify all potentially hazardous buildings within their respective jurisdictions on or before January 1, 1990. *This identification shall include current building use and daily occupancy load.*
>
> **and**
>
> Establish a mitigation program for potentially hazardous buildings to include notification to the legal owner that the building is considered to be one of a general type of structure that historically has exhibited little resistance to earthquake motion. *The mitigation program* <u>*may*</u> *include (1) the adoption by ordinance of a hazardous buildings program which specifies measures to strengthen unreinforced buildings, (2) measures to change the use to acceptable occupancy levels or to demolish the building, (3) provision of tax incentives available for seismic rehabilitation and low cost seismic rehabilitation loans available under Division 32 of the Health and Safety Code, (4) application of structural standards necessary to provide for life safety above current code requirements, and other incentives to repair buildings which are available from Federal, State, and local programs. Compliance with adopted hazardous buildings ordinance mitigation programs are intended to be the responsibility of building owners not local governments.*

Thus, the scope of mitigation programs is defined by local municipal jurisdictions but the costs of implementing such mitigation programs are generally paid for by building owners. For this reason, a cost-benefit analysis has been conducted to determine if the costs to comply with the ordinance would have significant adverse effects on the economic well being of the community. Chapter 10 of the EIR addresses this concern.

<u>Recent Legal Developments: Assembly Bill 204</u>

In July of 1991, the Governor signed Assembly Bill 204 which mandates that the current version of the State Model Ordinance (UCBC Appendix Chapter 1) shall be adopted into the building codes of local jurisdictions within the State of California. Once the legislation becomes fully effective (after July 1, 1993), any City requiring a mandatory upgrade program will have to adopt this standard (which is, in essence, the State Model Ordinance currently being promulgated by the Seismic Safety Commission). **This development puts the objective of adopting a less intensive standard, or a standard which is tailored to the needs and seismicity of a particular city or county, into a fixed time frame limited by the new law.** The new law has a 'grandfather" clause which will permit cities with technical standards adopted prior to mid-July 1993 to proceed with upgrade programs under locally developed ordinances. However, implementation of lessor standards would probably require an applicant to obtain a building permit prior to July of 1993; permits applied for after this date would need to comply with **Level III** standards.

There are a number of unresolved and confusing legal and administrative issues that have evolved as a result of this recent legislation. Apparently most cities and many interested lobbying groups with an interest in the unreinforced masonry problem were unaware of this development and considerable confusion has begun to evolve about how the adoption of this standard effects compliance with the State Unreinforced Masonry law. The original law passed by the state was passed with the legislative intent that standards would be established by local jurisdictions which would be responsible for designing a "mitigation plan" to

comply with the law. With the passage of this new legislation, the original intent of the Unreinforced Masonry Law may have been undermined, at least to a degree. AB 204 does not require the adoption of mandatory strengthening but it does require the adoption of a **Level III** standard **if** a jurisdiction in Seismic Zone 4 ultimately establishes a mandatory strengthening program.

Since several cities with a large number of unreinforced buildings are currently in the final stages of considering programs with less intensive upgrade standards than the UCBC Appendix, it is somewhat unclear how these locally adopted standards will relate to the future change in the building code. For example, if a **Level I** program is adopted at this time and in the future if a building has a proposed change of occupancy or use that under normal UBC provisions would necessitate structural work, would the new standards apply or would the adopted ordinance prevail as the standard? For cities such as Oakland, San Francisco, Santa Monica, and Ventura which are all considering multi-level strengthening standards (combined **Level I and III** programs for different types of buildings), the passage of AB 204 creates considerable confusion. Cities effected by this legislation are either reconsidering the advisability of interim, less stringent strengthening standards or preceding with adoption of alternative standards without delay. Moreover, the State Building Standards Commission may approve additions or deletions to the UCBC Appendix 1 (pursuant to Health and Safety Code section 17922) and therefore it is not possible to determine with certainty at this time how AB 204 would ultimately be implemented in July of 1993. The State Building Standards Commission may also clarify or modify what building activities would require compliance with the new law. These potential changes would be included as amendments or deletions to the legislation when the State Building Standards Commission formally promulgates UCBC Appendix 1 as regulation.

Other legislation is currently being considered at the state level which may provide exemptions to unreinforced building owners attempting to comply with the new building code standards. Specifically, legislation has been proposed which would exempt conformance with handicapped requirements and current fire, plumbing, and electrical codes. Legislation has also been proposed which would require all jurisdictions to adopt a mandatory strengthening standard; with the adoption of AB 204, this mandatory standard, by default, would be a **Level III** program in Seismic Zone 4.

A Synopsis of Prior Ordinance Proposals

The City of Ventura has attempted on several occasions (between January 1988 and June 1989) to pass an ordinance related to the upgrading of unreinforced masonry buildings. Public controversy over these proposals has been extensive. During the first set of hearings, the City Council was presented with a series of options ranging from a simple notification of a hazardous condition to undertaking a major structural upgrade. After further study and public meetings (summarized below), a second reading of a proposed ordinance was presented for consideration. At this time, staff recommended a **Level II** upgrade (Option 5 described in Section 1.4 of this chapter). In response to public concern over this proposal, the City's EIR Committee decided that an EIR should be prepared to fully evaluate all alternatives and to describe the probable environmental consequences of various options. This decision was made after a comprehensive study of the issue which is summarized below.

Initial Efforts

The 1988 **Level II** ordinance proposal was the product of an extended study of the unreinforced building problem and how it should be solved. In 1985, the City hired **John Kariotis and Associates**, Structural Engineers, to assist the Division of Building and Safety to survey unreinforced masonry buildings in Ventura and to prepare recommendations for structurally upgrading these buildings. The original survey identified 172 unreinforced buildings with approximately 830,500 square feet of floor area, 250 businesses with 640 employees, 97 apartment units and 78 hotel rooms. Some of these structures were exempted from the ordinance submitted to the Council. The proposed ordinance would have exempted dwellings with less than five units and private garages. At the time of proposal, the **Level II** ordinance would have been applicable to 147 unreinforced buildings with approximately 791,900 square feet of floor area, 239 businesses with 590

employees, 97 apartment units and 78 hotel rooms. Presently, the inventory of existing structures has been reduced slightly as a result of demolition or rehabilitation.

In 1987, the survey and the City consultant's recommendations for upgrading, including probable costs, were completed and presented at a study session of the City Council. John Kariotis' recommendations for upgrading were based on the results of the building survey and a geologic "Seismic Hazard Analysis" prepared by **Earth Technology Corporation** (ERTEC). The recommendation made in 1987 was that the City should adopt an unreinforced masonry upgrade ordinance similar to the ordinance adopted by the City of Los Angeles, but with slightly diminished upgrade requirements due to the potentially lower seismicity of San Buenaventura.

In 1987, the City hired **Howard Stup and Associates**, structural engineers, to prepare construction cost estimates for nine typical buildings in the City of San Buenaventura. This financial prediction was performed in response to building owner concerns about the cost of the recommended upgrading. The purpose of the cost analysis was to obtain estimates for building upgrading in the City of San Buenaventura based on local engineering expertise and contractor rates, instead of relying on statistics on upgrade costs provided by the City of Los Angeles. Estimated construction costs for the proposed ordinance upgrading ranged from $3.23 to $13.10 per square foot, depending on the size of the building and whether or not it had an open storefront. The survey information, consultant's upgrading recommendations and cost analysis were presented to the building owners, building tenants, contractors, architects and others during public presentations held in 1988. The proposed ordinance generated substantial controversy and questions were raised about the economic consequences of various upgrade options.

Prior to making the decision to prepare an EIR, in 1988, the City hired **Staal, Gardner and Dunne** to review the "Seismic Hazard Analysis" prepared by ERTEC to assist the City in defining upgrade standards for the City. The purpose of this review was to determine if the ERTEC report over or under predicted the seismicity of Ventura as incorporated into the proposed ordinance provisions. The review indicated that the ERTEC report probably under predicted the seismicity of the area suggesting that the Kariotis upgrade was potentially less intensive than was warranted. The issue of probable seismicity is one of the most important aspects of the EIR analysis. This issue is discussed in the Geologic Hazards section of the EIR (Chapter 6).

The information obtained by the engineering consultants and the Division of Building and Safety was presented to the community during a series of public meetings held between 1987 and 1988. These meetings encompassed a variety of topics including:

- May 4, 1987 — City Council Study Session - Kariotis and City staff (Owners and Tenants invited)
- June 10, 1987 — Ventura Chapter AIA Study Session - City staff (Architects, Engineers and Contractors invited)
- July 1, 1987 — Building Owners Study Session - Kariotis and City staff (Owners and Tenants invited)
- July 9, 1987 — Downtown Association Presentation - City staff
- March 31, 1988 — Building Owners Study Session - Engineering consultant and City staff (Owners invited)
- May 9, 1988 — City Council Study Session - Engineering consultant and City staff.

At the time of initial consideration of an ordinance in December, 1987, staff presented five potential courses of action for ordinance adoption including:

1. No Mandatory Upgrade Ordinance

2. Mandatory Upgrade at Time of Sale

3. Mandatory Upgrade When Improvements in one Year Exceed 25% of the Building Value

4. Mandatory Upgrade to Level I - Established Time Limits Based on Occupant Loads

5. Mandatory Upgrade to Level II - Established Time Limits Based on Occupant Loads

Level I required two basic relatively minor strengthening activities and Level II was a more encompassing structural renovation which was applicable to a relatively small number of buildings in the City's stock of unreinforced structures. The Level II upgrade was primarily conceived as a program to strengthen buildings with an open store front. The proposed ordinance submitted to Council in early 1988 was based on Option No. 5. Administratively, the originally recommended ordinance would have required:

- notification by the City that the structure would sustain damage in a moderate earthquake and therefore a classification of hazardous building would be applied to the property;

- this notice would then be recorded with the County Recorder;

- title insurance companies would be notified of the hazardous status of the structure;

- the owner would be required to obtain a structural engineer's analysis of the structure--the report would specify remedial actions necessary to correct existing problems and to assure reasonable life safety and property damage prevention in the event of a moderate earthquake; and

- the owner would be required to implement the structural engineer's recommendations within a specified time frame (depending on occupant loadings) ranging from 5 to 10 1/2 years from ordinance adoption. Upgrades would be required to meet minimum **Level II** criteria (or more ambitious structural work depending on the outcome of the engineering analysis).

<u>The 1988 Council Draft Ordinance</u>

A revised draft Unreinforced Masonry Upgrading Ordinance was prepared based on the City Council motion passed at the December 12, 1988 public hearing for a modified Level 1 upgrade. The revisions to the draft ordinance made between the first and second reading provided for a five year delay in implementation for each affected unreinforced building within 6 months of ordinance adoption and an appeal process to the Community Development Director and City Council to allow for flexibility in construction phasing.

In addition to the adoption of Option 3, Level I upgrading, 5 year time delay, 12 month construction completion, and confirmation of the EIR negative declaration, the Council considered adopting four additional recommendations including requiring that:

1. All structures upgraded using City loan funds must be done to Level II standards.

2. A change in occupancy (intensification of use per UBC definitions) would require upgrading to Level II standards.

3. For any unreinforced building in the defined downtown parking area, the zoning ordinance be amended to allow replacement "like for like" without meeting current parking or setback requirements. This provision would be applicable for 10 years after adoption of the ordinance and replacement must occur (permit issued and construction commenced) within 1 year following demolition.

4. The City would cooperate with the County Assessor to provide the necessary "certificates" to assist the building owner in getting a 15 year property tax exemption allowed for seismic upgrading work done to comply with a local ordinance.

The advisability of implementing this option is discussed in the Alternatives Analysis (chapter 12)

Although these recommendations were presented for City Council Consideration on January 9, 1989, the revised ordinance proposal (Level I upgrade only) was not adopted. The ordinance proposal was remanded to the Environmental Impact Report Committee on May 4, 1989 which ultimately recommended preparation of an EIR.

Thus far, despite very considerable efforts to adopt an ordinance, the City has not yet achieved this objective. However, the Division of Building and Safety has sent a notice to all property owners with unreinforced buildings which reads (in part):

> *"Widespread concerns over earthquake safety caused the State Legislature to pass SB 547 in 1986. This law requires every local jurisdiction in Seismic Zone 4 to identify and establish a mitigation program for all "potentially hazardous* [unreinforced brick] *buildings"....This letter serves as formal notice that the City of San Buenaventura has determined your building....qualifies as an unreinforced masonry building (URM) and is "potentially hazardous. This notice is to provide basic, minimal compliance with State law...."*

With completion and ultimate certification of this EIR, the City intends to adopt a mandatory seismic strengthening ordinance to achieve further compliance with State law.

3.3 Unreinforced Masonry Structures: Historic Background to the Technology and Definition of Terms

Between the settlement of California in the mid 18th century and about 1930, the construction of buildings fabricated from clay soil fired into bricks was an important and for some years, a dominant construction material used in commercial and residential buildings in older California cities. Unfired adobe brick was the characteristic construction material used in California from about 1769 to the mid 19th century. Sun dried adobe building bricks were about four times the size of conventional modern building bricks, a size difference that was in part due to the structural problems of creating larger structures and walled compounds without any reinforcing structural skeleton. The use of high temperature firing of thinner, smaller bricks was a technology well understood by the Spanish missionaries; "Ladrillo" brick and roof tiles were commonly used in conjunction with adobe bricks through the mid 18th century in California cities.

Techniques for the manufacture of lime mortar were also imported from Europe and introduced into California by the Spanish Franciscan Missionaries.

With the development of ports, wharfs, and the completion of a road network linking northern and southern California, the immigration of Chinese, Russian, Italian, Portuguese, English and French to Ventura, as well as Americans from the east coast, began in earnest. This process was well under way by the time the California Missions were secularized in 1834 and together with the increasing diversity of the ethnic population, new types of building materials and construction styles developed. The Chinese, Italian, and Portuguese immigrants often constructed homes of fired brick while English, French, Russian and Americans built with wood, a technology more familiar to these groups. As a commercial center developed in downtown Ventura, the fabrication of kiln fired building brick became an important local industry. A very substantial number of unreinforced brick buildings were created in downtown Ventura between 1850 and 1930.

Then, several developments encouraged the gradual replacement of unreinforced brick with other materials. Pre-cut wood became more readily available through an extensive rail system linking lumber depleted areas in the south with the northwest coast where timber was abundant and inexpensive. The ongoing evaluation of construction technology eventually provided an alternative set of methods for constructing larger commercial buildings using less labor intensive techniques and stronger materials than unreinforced brick. Also, between 1908 and 1928, major earthquakes in San Francisco and Santa Barbara (and less damaging quakes in surrounding communities) clearly demonstrated the inadvisability of constructing buildings out of unreinforced brick materials so prone to massive failure in moderately strong quakes. The development of uniform building codes and seismic standards from 1930 to the present ultimately eliminated unreinforced brick structures as an acceptable building practice. Now, brick is primarily used as a veneer, not as a load bearing wall system unless other structural reinforcement is provided. Brick is certainly the most common type of historic masonry structure used in local buildings but it is not the only material, as the following definition of unreinforced masonry structural materials clarifies.

Definitions: What is an Unreinforced Masonry Structure?

Masonry encompasses many materials, including brick, adobe, hollow clay tile, fieldstone, limestone, sandstone, marble, granite, and terra cotta. Sometimes several of these materials are combined in a single building with brick usually serving as the load bearing construction material with one or more of these other materials being used as facing or decorative elements on the exterior walls.

Until the industrialization of California occurred in the mid 18th century which provided cutting machines and effective, inexpensive transportation from quarries, building with stone was prohibitively expensive. Along the California coast where sandstone is abundant, it is not unusual to find modest wood dwellings with massive cut stone steps and foundations. During the nineteenth century when cut stone became more available, this material was frequently used as a veneer applied to brick bearing walls and was used structurally for columns, window heads, sills, and steps.

Brownstone was a very popular sandstone building material in the decades from 1850 until 1890. Actually a type of sandstone, brownstone is extremely soft and easy to carve, but it is also porous and vulnerable to freezing and thawing cycles. Brownstone was almost always used as a facing material, but because of heavy demand, the quality of quarrying and setting methods were not always satisfactory. Stone structures were very uncommon in Ventura but a substantial number of buildings in Los Angeles were created using sandstone materials. Erosion, staining, and deterioration generally affect portions of this type of stonework, depending on the degree of exposure to the weather and such features as sheltering cornices or overhangs.

In the seventeenth and eighteenth centuries, brick was molded by hand and then later by machines and fired in kilns. Sizes were not standardized but generally followed European precedents. Unfired adobe and kiln fired brick are by far the most common unreinforced structural materials in the inventory of older structures in Ventura.

These bricks are generally held together by a poor quality lime mortar and other variations of lime based cement. The total replacement of mortar in the horizontal and vertical joints of a brick or stone structure is a long and expensive task. The periodic repair of portions of deteriorated mortar joints is therefore preferable. Mortar joints are often "washed out" by faulty gutters and downspouts causing repeated cascades of water on a specific portion of the masonry. Dampness may also penetrate masonry walls by capillary action as a result of subsurface and foundation conditions that are unrelated to mortar. The pattern of the masonry joints is a significant element in the architectural character of a historic structure. The traditional appearance of an old building can be radically altered by subtle changes in the width, color, and texture of the mortar joints.

Terra cotta is an ancient material used initially in a mass produced content by the Etruscans and Romans. Because terra cotta clay was abundant and easily worked, it was favored for its decorative qualities. Fired terra cotta is extremely durable, but brittle. Unglazed, its surface is porous and invariably erodes when used in building construction. Until the late nineteenth century, unglazed molded decorative terra cotta elements were generally combined with brick masonry. Today, silicone coatings and other sealants help to reduce its moisture absorbing qualities of these materials. There are few structures in Ventura with anything other than roofs and cornice elements made of terra cotta.

At the end of the nineteenth century, mass-produced glazed terra cotta facing began to be extensively used on high-rise, iron-framed structures. It served as both fireproofing and facade and was lighter and cheaper than stone because it could be molded rather than carved. Terra cotta glazes mimicked stone texture and color so successfully that many architects and owners have been surprised at the deception. Many of the earliest installations were, in a sense, experimental and have not proved to be as durable as their original builders expected. Widespread manufacturing of terra cotta ceased during the Depression when other machine produced materials replaced it as a building material. **Terra cotta structural bricks have also been used as a building material in a selection of the unreinforced buildings in the city; these bricks provide even less structural support than courses of sold clay tile brick.**

The structural foundations for unreinforced masonry buildings in Ventura are generally comprised either of large, unmortared sandstone blocks, courses of adobe brick with poor quality mortar, or rock rubble trench-footings (usually filled with rounded beach stones) which were usually constructed on unconsolidated and uncompacted soil. Some of these structures also have conventional concrete footings. In Ventura, the soils in the downtown area, where the majority of the unreinforced masonry buildings are situated, contain relatively dense concentrations of unconsolidated rubble from archaeological deposits associated with 17th and 18th century occupation of Ventura. Combining these conditions with the inherent rigidity and lack of strength in an unreinforced wall clearly illustrates the need for some form of seismic upgrading of these structures. **It is important to understand that most of the upgrading programs studied in this EIR (with the exception of the options which require even more strengthening than Level III programs) do not account for the poor quality of the footings underneath many (if not most) of the buildings in the downtown Main Street corridor. None of the strengthening programs currently being contemplated by the City address the problems related to poor quality foundations. This situation will tend to result in an underestimation of the damage that will occur in the event of a major quake.**

Throughout the EIR, a number of technical terms have been used that require definition. Most of these terms and phases are not easy to explain in simple, non-scientific terms. Therefore, a glossary has been included in the EIR to facilitate comprehension of most concepts. To the extent possible, technical and scientific terms, theories, and methods of analysis have been phrased to facilitate public understanding.

3.4 Inventory of Unreinforced Masonry Structures

The inventory of unreinforced masonry structures in the City of Ventura was prepared by City staff in consultation with John Kariotis, Structural Engineer. A substantial amount of information was supplied in the inventory relating to current land use, valuation, occupancy, and structural characteristics. In addition,

technical information about wall thickness, presence or absence of party walls, and other important data was recorded by Kariotis. Compared to inventories examined by the consultant in other cities, the data base for Ventura is exceptionally complete, refined, and useful for evaluating the soundness and durability of structures in the event of an earthquake. The Kariotis inventory examined all unreinforced masonry structures in the City. **Tables 3-1** summarizes pertinent available data about all of the unreinforced masonry buildings in the City subject to the proposed ordinance.

Structures Excluded from Originally Proposed Ordinance

Once this inventory was assembled, City staff evaluated what structures could be exempted from the originally proposed ordinance and how to simplify the classification system used to organize the inventory. The subsequent reduction of the inventory resulted in the exclusion of residential structures comprised of five or less units and several other types of structures. Small residential buildings typically have substantial internal structural support resulting from the creation of rooms, partitions, and the anchoring of interior surfaces to exterior walls. The typical presence of these interior modifications was the primary rationale for excluding small residential buildings from compliance with the ordinance.

The inventory of different types of unreinforced buildings in the City was ultimately simplified into a five category typology. These categories were defined using occupancy and building size criteria in the Uniform Building Code and different project phasing requirements were developed for each class of structure. The following section on Project Phasing defines the building types included in the final inventory. These tables display not only buildings that will be subject to the proposed ordinance but also other structures (including some exempt from any future ordinance). **The EIR Technical Appendix contains a list of buildings included in the inventory submitted to the State as well as the complete data base developed by the City that was used to develop the summary table presented on the following pages.**

3.5 Review and Summary of Ordinance Options Previously Considered by the City

The proposed ordinance options considered thus far by the City differ substantially from one another in a variety of ways. In this section, the content of each option is reviewed and distinguished from other alternatives. This discussion also presents a preliminary comparison of both less and more restrictive alternatives. The text of each proposed ordinance summary prepared by City Attorney and Building and Safety Division staff is presented in the EIR Technical Appendix. The salient features of all these options are compared in the following discussion and, in the Alternatives section of the document, several of these options are compared in detail. The numbering scheme used by the City in prior hearings has been preserved.

Content of the Ordinance Proposals

Option 1A:

Project Description: An ordinance that would require the City to notify the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) that their building is considered to be a potential hazard in the event of a moderate earthquake. The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to record the notice with the Recorder. The notice would remain on file until appropriate seismic upgrades have been completed. The seismic upgrades required to remove the notice from title would consist of all of the following:

1. Anchor and brace parapets.
2. Anchor walls at roof and upper floor levels.
3. Shear connection of existing roof and floors at the diaphragm edges.

TABLE 3-1

UNREINFORCED MASONRY BUILDINGS SUBJECT TO THE PROPOSED ORDINANCE

BUILDING ADDRESS		SQUARE FOOTAGE	OWNER	TENANT	TYPE OF USE
10	CALIFORNIA ST S	5,300	BERTELSEN KARL H ET AL	COUNTRY CUTTERS	HAIR SALON
31	CALIFORNIA ST S	1,188	LINDSAY GORDON K-V M TRUST	LINDSAY INC	
40	CALIFORNIA ST S	615	BERTELSEN KARL H ET AL	JESSICAS POTTERY	POTTERY & GIFTS
66	CALIFORNIA ST S	3,960	LEVY GILBERT Z TRUST	66 CALIFORNIA	RESTAURANT
107	CALIFORNIA ST S	26,970	MASONIC TEMPLE ASSN	MASONIC BLDG	OFFICE
26	CHESTNUT ST S	728	CHESTNUT PROPERTIES LTD	VENTURA THEATRE	NIGHT CLUB/PROMO
111	DOS CAMINOS AV S	1,349	VAVRUCHE JAMES*-JUANITA*	KAWASKI WHSE	
980	FRONT ST E	6,755	BUTTERBAUGH JAMES R	THE WHARF	GENERAL MERCHAND
180	GARDEN ST N	3,626	BAKER MYRON E-ADELLA M	BAKER, MYRON	WOODWORKING
273	HEMLOCK ST S	7,740	MAC LEOD GEORGE-REBECCA TR	WAREHOUSE	OFFICE
283	HEMLOCK ST S	4,350	MAC LEOD GEORGE-REBECCA TR	OFFICE-MCLEOD	
305	KALORAMA ST S	6,900	BICE DAREL L-CATHY D	SENSATIONS	RETAIL JEWELRY
183	MAIN ST E	10,550	ARCHDIOCESE OF LOS ANGELES	HOLY CROSS	
204	MAIN ST E	2,202	CITY OF SAN BUENAVENTURA	PIERANO STORE	
208	MAIN ST E	1,953	CITY OF SAN BUENAVENTURA	WILSON STUDIO	
210	MAIN ST E	3,975	SCHULZE WILLIAM R-VIRGINIA J	GINGER'S ART	HOBBY/CRAFT
211	MAIN ST E	7,322	CH CATHOLIC ROMAN	MISSION	MUSEUM
221	MAIN ST E	10,413	ARCHDIOCESE OF LOS ANGELES	MISSION GIFT SHP	GIFT SHOP
230	MAIN ST E	4,743	MEYERSTEIN ARNOLD-MARILYN	TRUEBLOOD THRIFT	THRIFT SHOP
240	MAIN ST E	1,824	PLATT ANN TRUST ESTATE	CHINESE GARDENS	RESTAURANT
243	MAIN ST E	2,628	ROMAN CATHOLIC ARCH OF L A	CHURCH WAREHSE	
247	MAIN ST E	2,352	CH CATHOLIC ROMAN	SAN BUENAVENTURA	THRIFT SHOP
248	MAIN ST E	3,500	PLATT ANN TRUST ESTATE	ROSARITA BEACH	RESTAURANT
260	MAIN ST E	13,062	PLATT ANN TRUST ESTATE	CAAN	THRIFT SHOP
265	MAIN ST E	9,900	ROMAN CATH ARCH OF L A	RET CHILDREN	THRIFT SHOP
278	MAIN ST E	9,975	GARFIELD FAM TRUST ET AL	AGUILARS HACIEND	RESTAURANT
294	MAIN ST E	10,371	GARFIELD FAM TRUST ET AL	RENDEZVOUS COCKT	AMUSEMENT MACHIN
301	MAIN ST E	3,750	STUPAY BARBARA S ET AL	THE RAGS CO	RETAIL CLOTHING
315	MAIN ST E	9,800	VENTURA MAIN III LIMITED	CLUB SODA	FOOD & BEVERAGE
324	MAIN ST E	1,914	VENTURA REALTY CO	HEARTS DELIGHT	BOUTIQUE
327	MAIN ST E	5,960	NOVATT TRUST	HEIRLOOMS ANTIQU	RETAIL ANTIQUES
328	MAIN ST E	4,321	VENTURA REALTY CO	HEIRLOOMS ANTIQU	ANTIQUE SALES
337	MAIN ST E	2,880	COASTAL DEVELOPMENT GROUP IN	INGRID'S KITCHEN	RETAIL KITCHEN
343	MAIN ST E	3,800	KALLUSKY WILLIAM-A NADINE TR	STAR LOUNGE	COCKTAIL LOUNGE
353	MAIN ST E	1,875	LEFCOURT ZOLA-BABA	JULIO'S SHOE REP	SHOE REPAIR

BUILDING ADDRESS	SQUARE FOOTAGE	OWNER	TENANT	TYPE OF USE
359 MAIN ST E	2,500	LEFCOURTE ZOLA-BABA A	3 STAR BOOK NEWS	AMUSEMENT ARCADE
363 MAIN ST E	12,850	CUMMINGS MEL F	GNS MINI MARKET	MARKET
374 MAIN ST E	6,100	D G H PROPERTIES	TRADING POST	USED FURNITURE
375 MAIN ST E	4,056	GREEN NANCY E	HESS HARDWARD	HARDWARE STORE
378 MAIN ST E	1,862	GINGRAS PAUL A	VENTURA VACUUMS	SALES & REPAIR
379 MAIN ST E	2,730	GREEN NANCY E	CARLSONS JEWELRY	PAWN BROKER
384 MAIN ST E	5,010	LEFCOURT ZOLA-BABA	MAIN ST FLEA MKT	ANTIQUES/CRAFTS
391 MAIN ST E	3,480	GREEN NANCY E	SECOND TIME AROU	SECOND HAND BOOK
401 MAIN ST E	5,000	KULICK SHERMAN A ET AL	MILLS JEWELERS	JEWELRY STORE
409 MAIN ST E	12,150	PUOPOLO FAMILY TRUST	CLASSIC FURNITUR	FURNITURE STORE
427 MAIN ST E	9,550	PARSA DARYUSH J-KATHLEEN L	THE CATS MEOW	ANTIQUES/COLLECT
434 MAIN ST E	4,375	WHITE MARY S	DISCOVERY SHOP	THRIFT SHOP
440 MAIN ST E	1,920	CHAKIRES NICOLAS J EXEC	FOLLOW YOUR DREA	GIFT SHOP
443 MAIN ST E	14,838	VENTURA REALTY CO	DREAMWEAVER BEDS	FURNITURE SALES
446 MAIN ST E	2,000	CHAKIRES NICOLAS J EXEC	PAUL BUNYON SHOP	MENS WEAR
451 MAIN ST E	8,889	READ CHRISTINE ET AL	UP YOUR ALLEY	RETAIL CLOTHING
454 MAIN ST E	3,075	VENTURA REALTY CO	FANTASIA	RETAIL IMPORTS
456 MAIN ST E	10,000	VENTURA REALTY COMPANY	FRANKIE'S	RESTAURANT
467 MAIN ST E	9,650	VENTURA REALTY CO TR T178569	DREAMWEAVER	FURNITURE SALES
472 MAIN ST E	5,000	LORING PRISCILLA E	VACANT	
474 MAIN ST E	5,212	WARREN EDMUND J-HILDA	BUSY BEE CAFE	RESTAURANT
477 MAIN ST E	900	PACIFIC COAST HOTELS INC	LADIES & GENTLEM	CONSIGNMENT SHOP
494 MAIN ST E	23,280	LAGOMARSINO MARJORIE E TR ET	HEIRLOOM ANTIQUE	RETAIL ANTIQUES
512 MAIN ST E	16,666	IOOF LODGE 201 VENTURA	TIPS RESTAURANT	RESTAURANT
546 MAIN ST E	3,288	DI RODIO JOE	ECONOMY UPHOLST	UPHOLSTERY SHOP
554 MAIN ST E	2,400	LINDER ERIC-BARBARA	POINSETT. COLL.	RETAIL FURNITURE
560 MAIN ST E	3,350	BOYD DOROTHY D TRUST	FRANK'S FURNITUR	USED FURN SALES
565 MAIN ST E	1,920	MEYERSTEIN ARNOLD-JERILYN	COPY MACHINE	COPY SERVICE
566 MAIN ST E	2,300	CHONETTE DAVID W	NOSTALGIC MEMOR	COLLECTIBLE SALE
569 MAIN ST E	6,470	CHILCUTT WILLIAM D ET AL	CHILCUTT REALTY	REAL ESTATE BROK
574 MAIN ST E	4,140	TOM YEH-SO KUEN	LUNCH BASKET	SANDWICH SHOP
588 MAIN ST E	4,339	CRYNE LINCOLN E-TERRY	SEA & SAND SPORT	RETAIL SALES
592 MAIN ST E	4,157	MINAMI YAICHIRO	BAHNS JEWELERS	JEWELRY STORE
651 MAIN ST E	10,965	VENTURA COUNTY OF	COUNTY BUILDING	
710 MAIN ST E	5,200	CH SCIENTIST FIRST CHURCH	CH. SCI. CHURCH	
7[illegible] MAIN ST E	3,577	MILLER ROSE TRUST	MAIN ST MARKET	MARKET
804 MAIN ST E	1,742	ACUNA ALEJANDRO M	4 DAY TIRE	TIRE SALES
879 MAIN ST E	6,427	PARSA DARYUSH J	ORIENTAL ACCUPR	MASSAGE ESTABLIS

BUILDING ADDRESS		SQUARE FOOTAGE	OWNER	TENANT	TYPE OF USE
952	MAIN ST E	2,500	MARTIN JERRY P-MARY L	THE COLE CO	4 UNIT APT
981	MAIN ST E	1,504	REGAN LUCILLE E TRUST	ARROW RENTS	EQUIPMENT RENTAL
1,294	MAIN ST E	1,900	ELARDO ANGELO-HELEN J	SANCHEZ, JORGE	DENTIST
1,418	MAIN ST E	500	FRAHAZ INC	A & E LOCK &KEY	LOCK/KEY SALES
1,474	MAIN ST E	2,067	JONES COLE CO	CANDY'S BAZAAR	SECOND HAND STOR
1,484	MAIN ST E	3,435	JONES COLE CO	VENTURA MUSCULAR	MASSAGE ESTABLIS
1,532	MAIN ST E	6,100	HANTGIN JIM ET AL	ISENSEE FLOOR	FLOOR COVERING
1,721	MAIN ST E	2,052	PATISAUL JUANITA J	JUANITA'S INTER.	INTERIOR DECORAT
1,730	MAIN ST E	2,576	KINGSTON NELL W TRUST	MAIN EVENT HAIR	BEAUTY SALON
1,780	MAIN ST E	7,200	SUNWEST ENTERPRISES	ART & JENNYS SEW	SALE/SERV SEW M
1,783	MAIN ST E	2,442	FEAR WILLIAM-MILDRED TR	BUENAVENTURA BIK	RETAIL BIKE SHOP
1,880	MAIN ST E	2,174	WILLIAMS CAROL A ET AL	DREAM 2 REALITY	RETAIL MUSIC EQU
1,890	MAIN ST E	3,240	STEVENS TRUST ET AL	KENPO KARATE	KARATE SCHOOL
1,910	MAIN ST E	10,184	STEVENS TRUST ET AL	PARADISE CAFE	SANDWICH SHOP
1,957	MAIN ST E	2,688	JUE ALLEN W	JUE'S MKT (EAST)	
2	MAIN ST W	7,000	ADDISON MAIN STREET TRUST	ALLEN'S FURNITUR	RTL SLS/FURN & M
28	MAIN ST W	3,302	ADDISON MAIN STREET TRUST	J H FLOORS	CARPET SALES
72	MAIN ST W	2,250	REDEV AGENCY-SBV	VACANT	
215	MAIN ST W	0	SAN BUENAVENTURA CITY OF	ORTEGA AD(VAC)	
46	OAK ST N	1,500	FROEDGE DENNIS M-KIM	OAK ST PROPERTY	REAL ESTATE
50	OAK ST N	2,190	RUEBE BAMBI L	21ST CENTURY	OFFICE/BROKER/IM
27	OAK ST S	6,201	JANKOVITZ FRANK	BATTLEFIELD SURP	RETAIL MILITARY
51	OAK ST S	13,148	VENTURA REALTY CO	LAMBERT TRAVEL	TRAVEL AGENCY
54	OAK ST S	5,150	SMITH RODNEY H ET AL	SALVATION ARMY	
4,200	OLIVAS PARK DR	2,921	SAN BUENAVENTURA CITY OF	OLIVAS ADOBE	
29	OLIVE ST N	6,000	PUBLIC WORKS INC	PUBLIC WORKS INC	SEPC EQUIP SALES
29	OLIVE ST N	3,216	PUBLIC WORKS INC	P W WAREHOUSE	
33	PALM ST S	3,500	GARFIELD FAMILY TR ET AL	DUNLAP TRUST	
24	SANTA CLARA ST E	4,368	SANTA CLARA PROPERTIES	CURLY'S UPHOLST.	AUTO UPHOLSTERY
516	SANTA CLARA ST E	3,610	PARSA DARYUSH J-KATHLEEN	ASIAN FIGHT ARTS	RETAIL SALES
540	SANTA CLARA ST E	37,176	ELARDO HELEN ET AL	MIDWICK HOTEL	HOTEL/42 UNITS
701	SANTA CLARA ST E	26,090	PACIFIC TEL-TEL CO	PAC TEL OFFICE	
1,001	SANTA CLARA ST E	7,650	NGUYEN HOI THI	ASIAN MARKET	APT
1,019	SANTA CLARA ST E	2,790	NGUYEN HOI THI	HACIENDA	
1,047	SANTA CLARA ST E	1,360	ABBOTT C NEIL-MAUREEN	PARKING GARAGE	
10,269	TELEPHONE RD	0	LOYAL ORDER MOOSE LODGE 1394	MOOSE LODGE	FRATERNAL ORGANI
154	THOMPSON BL E	1,505	KEHR FRANK W	WAVELINE SURF	RETAIL SALES
558	THOMPSON BL E	10,040	PECK WILLIAM L	APTS - PECK	

BUILDING ADDRESS		SQUARE FOOTAGE	OWNER	TENANT	TYPE OF USE
585	THOMPSON BL E	4,497	JC PROPERTIES	LEON'S TRANSMISS	
670	THOMPSON BL E	3,578	R M F DEVELOPMENT CO	OVERBAUGH, DON	FISH DELIVERY
692	THOMPSON BL E	1,145	GILMAN JOHN I-ARLENE C	OFFICE	
1,241	THOMPSON BL E	4,375	MAC LAREN TRUST	MACS AUTO UPHOLS	AUTO UPHOLSTERY
1,497	THOMPSON BL E	1,965	HANTGIN JIM ET AL	CUCINA D'ITALIA	RESTAURANT
1,695	THOMPSON BL E	1,364	MORALES CELESTINO-CARMELITA	REST HOME	
1,794	THOMPSON BL E	3,450	TAYLOR RICHARD L-KRISTIN W	NOYES PLUMBING	CONTRACTOR
1,887	THOMPSON BL E	1,200	VIZZO AGNES	VIZZO PLUMBING	
2,006	THOMPSON BL E	2,251	POULOS DIMITRIOS P-BRIGITTE	LIN. & CARP. CTY	LINEOLEUM INSTAL
2,036	THOMPSON BL E	1,080	HOWE CHARLES W	SOLARIS LIQUOR	MISC SALES
2,037	THOMPSON BL E	2,500	LYSKIN VICTOR A-EMILY B	VIC'S PLUMBING	PLUMBING/HEATING
2,110	THOMPSON BL E	21,850	MARBLE CALVIN D FAMILY TRUST	VENTURA VID/COM	RETAIL COMPUTERS
2,160	THOMPSON BL E	4,410	PRICE M H-C M FAMILY TRUST	PRICE AMERITONE	PAINT STORE
2,170	THOMPSON BL E	5,000	NEVILLE ROBERT D	NEVILLE AUTO REP	AUTO REPAIR
159	VENTURA AV N	6,780	PROSSER J E-A B TRUST	WAREHOUSE	
172	VENTURA AV N	3,382	PRANIS FAMILY TRUST	JOHNNYS MEX FOOD	MEXICAN FOOD
375	VENTURA AV N	2,788	GOLD COAST RENTALS	KIRBY VACUUM	VACUUM CLEANERS
390	VENTURA AV N	2,000	KARPAN HARRY L ET AL	THE ROCK HOUSE	BAR/MISC SALES
401	VENTURA AV N	2,728	BOYD DOROTHY D TRUST	AVENUE TV	SALES/SERVICE
404	VENTURA AV N	3,737	BELL MATTRESS FACTORY INC	BELL MATTRESS	
421	VENTURA AV N	3,000	GARCIA RICARDO-KATHLEEN	MAYAS MEX DELI	DELI
464	VENTURA AV N	3,230	WADEMAN ROBERT	VENTURA GLASS	GLASS SALES
545	VENTURA AV N	8,580	ACOFF FAMILY REV TRUST	WAREHOUSE	APT
591	VENTURA AV N	3,360	DATA FIVE INVESTMENTS LTD	DATA GRAPHICS	DATA PROCESSING
606	VENTURA AV N	18,480	EVANS MARK T-MARY M	VENTURA TATTOO	TATTOO STUDIO
1,290	VENTURA AV N	2,400	ESPOSITO FRANK TRUST	COIN LAUNDRY	LAUNDROMAT/SELF-
99	VENTURA AV S	1,100	SOUTHERN CALIF EDISON CO	SCE	

4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.

5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.

6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.

7. Repair existing masonry.

8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

This option requires that a recorded notice be placed on the property that it is a potentially hazardous structure. Removal of the notice would require compliance with **Level II** upgrade requirements. Because of the difficulty encountered in exchanging, selling, or otherwise disposing of a property with such a notice, considerable indirect pressure is created to upgrade structures. Palo Alto and other cities in California have had success with this approach to the problem; there are a substantial number of buildings currently being upgraded to remove the recorded notice on title.

Option 1B

Project Description: An ordinance that would require the City to notify the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) that their building is considered to be a potential hazard in the event of a moderate earthquake. The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to record the notice with the County Recorder. The notice would remain on file until appropriate seismic upgrades have been completed. The seismic upgrades required to remove the notice from title would consist of all of the following:

1. Anchor and brace parapets.

2. Anchor walls at roof and upper floor levels.

3. Shear connection of existing roof and floors at the diaphragm edges.

4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.

5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.

6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.

7. Repair existing masonry.

8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

A zoning ordinance amendment may be initiated concurrently to allow replacement of any potentially hazardous building, "like for like," without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

This ordinance is identical to Option 1A except, for buildings in the downtown area subject to the "defined parking area" zone of benefit, like for like replacement would be permitted. Option 1B would require a Level II upgrade to remove notice from the title. **Options 1A and 1B do not require a building owner to upgrade. However, because of the recorded notice, an owner would have considerable difficulty selling, exchanging, or obtaining loans using a noticed property as collateral. Thus considerable, though indirect, pressure is created by this option to encourage upgrading. Basically, market forces governing the sale and disposal of property would ultimately encourage renovation. On the other hand, such a proposal in an economically depressed City could have the effect of encouraging further economic decline.**

Option 2A

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings, to identify any deficiencies found to exist, and to propose appropriate solutions to strengthen the structure to alleviate any threat of collapse in the event of a moderate earthquake. The ordinance would not require owners to upgrade the conditions of their buildings to provide life safety protection or building damage reduction. The ordinance would, however, require the City to give notice of the potential earthquake hazard to title companies and insurance companies and to record the notice with the County Recorder. The notice would remain on file until appropriate seismic upgrades have been completed. The seismic upgrades required to remove the notice from title would consist of all of the following:

1. Anchor and brace parapets.
2. Anchor walls at roof and upper floor levels.
3. Shear connection of existing roof and floors at the diaphragm edges.
4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.
5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.
6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.
7. Repair existing masonry.
8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

A zoning ordinance amendment may be initiated concurrently to allow replacement of any potentially hazardous building, "like for like," without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

This alternative is similar to Options 1A and 1B except that a building owner would be required to obtain a structural analysis of the building and to propose solutions to inadequate seismic resistance. Once this report is obtained, nothing further would be required of the building owner; upgrading is not mandatory. This option has been adopted by the City of Santa Monica as an interim step in the upgrade process. Presently, Santa Monica is considering what type of upgrade requirements to mandate. Nearly all of the 170 building owners in Santa Monica complied with the request and nearly all the buildings were judged to have virtually no resistance to seismic events.

What this option provides for (in addition to the title notice also included in Options 1A and 1B) is a legal notification which places a building owners on notice that their structures are hazardous. And, **because the engineering analysis is obtained and funded by the owner, this procedure creates a legal (and ethical) responsibility for the owner. In the event of an earthquake that results in loss of life or business interruption for a tenant, occupant, or pedestrian, there is a possibility that individuals injured during an earthquake (or the families of fatally injured individuals) would pursue legal action for damages attributable to the building failure which was predicted by noticing .** This option, stated simply, makes it very difficult if not impossible for a building owner to claim that he is unaware of the dangers posed by continued use or occupation of their building. Options 2A and 2B are identical except Option B does not include the "like for like" replacement clause for buildings in the downtown parking area. A **Level II** upgrade would be required to remove the notice from the title.

Option 2B

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings, to identify any deficiencies found to exist, and to propose appropriate solutions to strengthen the structure to alleviate any threat of collapse in the event of a moderate earthquake. The ordinance would not require owners to upgrade the conditions of their buildings to provide life safety protection or building damage reduction. The ordinance would, however, require the City to give notice of the potential earthquake hazard to title companies and insurance companies and to record the notice with the County Recorder. The notice would remain on file until appropriate seismic upgrades have been completed. The seismic upgrades required to remove the notice from title would consist of all of the following:

1. Anchor and brace parapets.
2. Anchor walls at roof and upper floor levels.
3. Shear connection of existing roof and floors at the diaphragm edges.
4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.
5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.
6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.
7. Repair existing masonry.
8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

This option is identical to 2A except "like for like" replacement would not be permitted. This clause would tend to encourage some demolition of the existing building stock.

Option 3

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings. The ordinance would further require the owners of all potentially hazardous buildings to upgrade the conditions of their buildings, within specified time limits ranging from 5 years to 10 1/2 years, to a level which is intended to provide only minimum life safety protection with no measure of economic property protection in the event of a moderate earthquake. The seismic upgrade required would be all of the following:

1. Anchor and brace parapets.

2. Anchor walls at roof and upper floor levels.

3. Shear connection of existing roof and floors at the diaphragm edges.

The structural analysis would not need to be more extensive than to provide a basis for the above upgrades.

The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to be recorded with the County Recorder and remain on file until the seismic upgrades specified above have been completed. A zoning ordinance amendment would be initiated concurrently to allow replacement of any potentially hazardous building, "like for like", without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

Option 3 is the first of the ordinances considered thus far that would require any mandatory upgrading by building owners. This version of the ordinance would (1) mandate a recorded notice of hazardous conditions (as in prior options) and (2) specify a **Level I** upgrade to the structure as sufficient to enable removal of the title notice. As described in Chapter 5, a **Level I** upgrade requires only two of more than twenty-four different strengthening activities. The life safety improvement provided by a **Level I** upgrade is very minor. This version of the ordinance would require completion of mandatory improvements within a 5 to 10 1/2 year time frame (depending on building occupancy). **As documented in Chapter 10 of the EIR, the rationale for removing a recorded notification of an earthquake hazard with such minor structural improvements is questionable.**

Option 4

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings. The ordinance would further require the owners of all potentially hazardous buildings to upgrade the conditions of their buildings, within specified time limits ranging from 1 1/4 years to 9 1/4 years, to a level which is intended to provide only minimum life safety protection

with no measure of economic property protection in the event of a moderate earthquake. The seismic upgrade required would be all of the following:

1. Anchor and brace parapets.

2. Anchor walls at roof and upper floor levels.

3. Shear connection of existing roof and floors at the diaphragm edges.

The structural analysis would not need to be more extensive than to provide a basis for the above upgrades.

The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to be recorded with the County Recorder and remain on file until the seismic upgrades specified above have been completed. A zoning ordinance amendment would be initiated concurrently to allow replacement of any potentially hazardous building, "like for like", without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

Option 4 is identical to Option 3 in all respects except one: Option 4 requires completion of a **Level I** upgrade on high occupancy buildings within 1 1/4 years rather than within 5 years as provided in Option 3.

Option 5

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings. The ordinance would further require the owners of all potentially hazardous buildings to upgrade the conditions of their buildings, within specified time limits ranging from 5 years to 10 1/2 years, to a level which is intended to provide only minimum life safety protection with no measure of economic property protection in the event of a moderate earthquake. The seismic upgrade required would be all of the following:

1. Anchor and brace parapets.

2. Anchor walls at roof and upper floor levels.

3. Shear connection of existing roof and floors at the diaphragm edges.

4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.

5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.

6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.

7. Repair existing masonry.

8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to be recorded with the County Recorder and remain on file until the seismic upgrades specified above have been completed. A zoning ordinance amendment would be initiated concurrently to allow replacement of any potentially hazardous building, "like for like", without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

Option 5 resembles Option 3 in most respects with the important exception that considerably more structural renovation would be required to remove the notice on title. A mandatory **Level II upgrade would be required.** The timeframes for implementation of the **Level II** improvements would be identical to Option 3. A 'like for like' exemption would apply if an owner opted to demolish and build a new structure rather than upgrade.

Option 6

Project Description: An ordinance that would require the owners of all potentially hazardous buildings (defined in Government Code Section 8875 as buildings constructed of unreinforced masonry wall construction built prior to the adoption of local building codes requiring earthquake resistant design) to obtain a structural analysis of their buildings. The ordinance would further require the owners of all potentially hazardous buildings to upgrade the conditions of their buildings, within specified time limits ranging from 1 1/4 years to 9 1/4 years, to a level which is intended to provide only minimum life safety protection with no measure of economic property protection in the event of a moderate earthquake. The seismic upgrade required would be all of the following:

1. Anchor and brace parapets.

2. Anchor walls at roof and upper floor levels.

3. Shear connection of existing roof and floors at the diaphragm edges.

4. Retrofit buildings with non-continuous diaphragms between shear walls, when determined necessary by structural analysis.

5. Stiffen open store front structural systems to control lateral deflection, when determined necessary by structural analysis.

6. Strengthen shear walls parallel to an open store front, when determined necessary by structural analysis.

7. Repair existing masonry.

8. Repoint mortar joints, when masonry tests don't meet minimum strength requirements.

The ordinance would also require notice of the potential earthquake hazard to be given to title companies and insurance companies and to be recorded with the County Recorder and remain on file until the seismic upgrades specified above have been completed. A zoning ordinance amendment would be initiated concurrently to allow replacement of any potentially hazardous building, "like for like", without meeting current parking or setback requirements for a period of ten (10) years if the replacement were to occur (permit issued and construction commenced) within one year following demolition of any such potentially hazardous building.

Project Location: The proposed ordinance would affect approximately 145 potentially hazardous buildings in various locations in the City; a complete list of the addresses and a map showing locations is available at the Building & Safety Division public counter, Room 117, City Hall, 501 Poli Street, Ventura, California, between the hours of 8:00 a.m. to 4:30 p.m.

This option is identical to Option 5 except the timeframes for implementation would be briefer than permitted under Option 5.

Comparison of Ordinance Options

Each alternative ordinance proposal has two components, an administrative procedure and a set of remedial actions designed to encourage or require physical improvements to relevant structures. The public agency administrative actions (summarized in **Table 3-2**) common to all of the options considered by the City:

(1) to notify building owners that their structures are a hazard in the event of a moderate (or more severe) earthquake;

(2) to notify title companies of the identified hazardous conditions;

(3) to record the hazardous status notification with the County Recorder.

Other administrative actions (applicable only to several of the options) that would or could be undertaken at the building owners expense include:

(1) obtaining a structural inspection of the building which identifies proposed solutions to seismic problems;

(2) determining if the building should be demolished and replaced with a new building on a "like-for-like" replacement of previously existing square footage.

The effect of these proposed actions would be to encumber the relevant properties with a notice that would discourage lending institutions from participating in a sale of the property. Moreover, the value of the noticed property would probably decline because of the lack of support from financial institutions which would ultimately restrict the exchange or sale of the noticed buildings. These actions would encourage property owners either to upgrade their buildings or to dispose of their buildings through demolition or sale to well capitalized development firms with sufficient private leverage to bypass a lending institution. The State mandated minimum compliance with Government Code Chapter 12.2 Section 8875 is such a notification; indirectly, this noticing procedure creates substantial impetus to remove the notice through a program of upgrading. All versions of the proposed ordinance require some remedial action to remove the recorded notification and some versions of the ordinance (1) make specific time commitments on completing the upgrade process and (2) specify the level of structural work required.

Once the notification process is complete, what would the next step be for a property owner? Different versions of the ordinance establish different solutions to the problem of removing the adverse title notice. The possible actions that would be required to remove notice include:

- obtaining an independent structural analysis and completing required upgrades identified in the analysis;
- completing a **Level I** upgrade; or
- completing a **Level II** upgrade.

In essence, there are two choices outlined in the range of ordinance options: compliance with independently obtained structural analyses or compliance with City defined standards. Under certain options (where no mandatory upgrading is required), a building owner could simply hold the property without performing any structural upgrade.

The next question the proposed ordinance addresses is whether completing an upgrade would be mandatory for the current building owner. As displayed in **Table 3-3**, Options 3, 4, 5, and 6 all require upgrades on various timeframes which are related to the occupancy classification of the structure. Options 1A, 1B, 2A and 2B do not contain a provision for mandatory upgrading; whether an upgrade is done or not is entirely at the discretion of the building owners. The motivation for owners to proceed with upgrading is the incentive of removing the notice on the title to the property. Given the potential difficulty in financing improvements or exchanging the property with recorded building hazard notices, it is likely that at least a portion of present building owners would proceed with upgrades nonetheless. However, because of the way unreinforced buildings are exchanged (see Chapter 12 section 12.3) commonly in California, relying on the motive of removing a notification of hazardous conditions may be an unsatisfactory motivator in achieving compliance with new strengthening standards.

Another administrative provision in some of the proposed ordinances permits 'like for like' replacement of existing square footage with a new structure without requiring the new building to comply with current zoning requirements for parking, setbacks, and other essential provisions. This provision is an important and useful option to include in any ordinance. Such a provision allows the building owner to compare the costs of a mandatory upgrade to new construction and then to make a market decision regarding how to dispose of the property. This component of the ordinance is designed to permit the voluntary demolition and replacement of unreinforced structures by current property owners. All versions of the proposed ordinance except Options 1A and 2B provide this incentive to current building owners.

Remedial Actions: Level I or II Upgrade

Specific remedial actions presented in the ordinance are introduced in this section. Various versions of the ordinance specify in considerable detail what types of upgrading (at a minimum) must be performed to comply with hazard reduction requirements. The actions proposed in the engineering specifications of the ordinance involve eight different major undertakings, each of which provides (in theory) increasingly more reliable life safety enhancement and property damage reduction.

There are two types of upgrades proposed; **Level I** construction work is relatively minor and involves anchoring and bracing the parapets (the upper parts of the building facades that are usually the first parts of a structure to collapse in the event of an earthquake), anchoring walls at the roof and upper floor levels and shear connection of existing roof and floors at the diaphragm edges. Some California cities, San Francisco and Santa Monica, for example, established local requirements for performing these types of upgrades over three decades ago. **Level I** upgrades (often abbreviated as an "anchors and ties" approach to the problem), are certainly not regarded as state of the art structural solutions to building deficiencies. **Level I** upgrades are only designed to prevent the complete failure of walls; this level of effort would reduce fatalities from major wall and parapet collapse and would reduce the life safety hazards to people attempting to leave an unreinforced building during a quake. This upgrade standard would also prevent walls in a taller building from falling on adjacent smaller structures. This type of failure resulted in deaths in the Loma Prieta earthquake.

The **Level II** upgrade requires all three of these improvements plus:

- o retrofitting buildings with non-continuous diaphragms between shear walls (if determined necessary by the engineering analysis);

TABLE 3-2

ADMINISTRATIVE COMPONENT OF ORDINANCE									
ALTERNATIVE	NOTIFY BUILDING OWNERS THAT THEIR STRUCTURE IS A HAZARD	NOTIFY TITLE COMPANIES OF HAZARDOUS CONDITIONS	RECORD HAZARDOUS STATUS NOTIFICATION WITH COUNTY RECORDER	UPGRADE MANDATORY TO REMOVE NOTIFICATIONS	OBTAIN STRUCTURAL ANALYSIS OF BUILDINGS AND PROPOSE SOLUTIONS	UPGRADE MANDATORY FOR CURRENT BUILDING OWNER	ZONING ORDINANCE EXEMPTION	LIFE SAFETY PROTECTION UPGRADE REQUIRED	BUILDING DAMAGE UPGRADE REQUIRED
1A	YES	YES	YES	YES	NO	NO	NO	NO	NO
1B	YES	YES	YES	YES	NO	NO	YES	NO	NO
2A	YES	YES	YES	YES	YES	NO	YES	NO	NO
2B	YES	YES	YES	YES	YES	NO	NO	NO	NO
3	YES	YES	YES	YES	YES	YES-WITHIN 5 TO 10 1/2 YEARS	YES	YES	NO
4	YES	YES	YES	YES	YES	YES-WITHIN 1 1/4 TO 9 1/4 YEARS	YES	YES	NO
5	YES	YES	YES	YES	YES	YES-WITHIN 5 TO 10 1/2 YEARS	YES	YES	YES
6	YES	YES	YES	YES	YES	YES-WITHIN 1 1/4 TO 9 1/4 YEARS	YES	YES	YES

- actions to make open store front structural systems more rigid to prevent partial collapse (deflection)--this improvement is only necessary for some types of buildings and only if a structural engineer determines the improvement is warranted;

- strengthening shear walls parallel to an open store front (if determined necessary by the structural analysis);

- repair existing masonry as needed, and

- re-cement (repoint) mortar joints in cases where a masonry test does not meet minimum strength requirements.

The **Level II** upgrade is clearly more comprehensive than a **Level I** solution but **Level II** strengthening applies to a relatively narrow range of buildings--commercial structures with open store fronts. The gradual removal of portions of supporting walls in front of masonry buildings facing pedestrian corridors (to create open store fronts for retail displays) has created significant hazard problems in many older downtown areas throughout California. The **Level II** program is designed to correct these structural deficiencies. Both of these alternatives and the specific strengthening activities involved in their implementation are described in Chapter 5 of the EIR. **Table 3-4** summarizes the relationship between ordinance options and strengthening levels.

3.6 Project Phasing

The timetable for implementation of the proposed ordinance is based on a typology of uses, density of occupancy, and building classifications contained in the Uniform Building Code (UBC 1988 Edition). The UBC specifies occupancy classifications for every type of building in existence; this all-inclusive typology is based on the "character of a building's occupancy" (UBC Section 501).

This system of classification has been employed in the ordinance because it provides a general framework for defining uses which are proportionately equivalent to the number of persons exposed to earthquake risks. The logic of the timeframe for upgrading requires that structures with the highest potential for loss of life associated with the failure of an unreinforced masonry building shall be upgraded first and buildings with lesser occupancies have more time to comply with ordinance requirements.

Buildings which have actual occupancies lower than occupant loads projected in the Uniform Building Code would be required to conduct upgrades on the proposed schedule based on UBC occupancies regardless of whether existing uses may be lower intensity than projected under Code criteria. The proposed upgrading schedule for the ordinance options considered by the City are provided in the EIR Technical Appendix. The alternative time frames for implementation range from about 1 to 10 years, depending on occupancy class. The defined occupancy classes identified in the implementation phase of the ordinance include the following:

- Class I buildings include restaurants, schools, churches, bars, and meeting halls. These buildings have high occupancy to floor area ratio during hours of operation. A large number of people are typically present during the duration of building use. **All A and E occupancies are defined by the City as Class I buildings.**

TABLE 3-3

	ALTERNATIVE REMEDIAL ACTIONS LISTED							
	1A	1B	2A	2B	3	4	5	6
1. Anchor and brace parapets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Anchor walls at roof and upper floor levels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Shear connection of roof and floors at the diaphragm edges	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Retrofit non–continuous diaphragms between shear walls (if necessary)	Yes	Yes	Yes	Yes	No	No	Yes	Yes
5. Stiffen open store front structural systems to control lateral deflection (if necessary)	Yes	Yes	Yes	Yes	No	No	Yes	Yes
6. Strengthen shear walls parallel to open store front (if necessary)	Yes	Yes	Yes	Yes	No	No	Yes	Yes
7. Repair existing masonry.	Yes	Yes	Yes	Yes	No	No	Yes	Yes
8. Repoint joints if tests fail minimum strength requirements.	Yes	Yes	Yes	Yes	No	No	Yes	Yes
	LEVEL II				LEVEL I		LEVEL II	

- o Class II structures include both residential and commercial buildings with over 100 occupants. Examples would generally include offices with a gross square footage over 10,000 square feet, retail operations over 3,000 square feet. **All B and R occupancies with over a 100 occupant load would be included in this classification.**

- o Class III structures are also typically used for retail, commercial, or residential purposes but the populations using these structures are smaller than Class II occupancies. Class III structures include business and residential occupancies with an occupant load of 51-100 persons. Examples include offices with 5,100 to 10,000 square feet, retail stores with 1,500 to 3,000 square feet and apartments or hotels ranging from 10,000 to 20,000 square feet. **All B and R occupancies with between a 51 and 100 occupant load would be included in this classification.**

- o Class IV businesses and residential structures are defined as buildings with occupancy loads of less than 51 persons. **As defined by the City, this class includes B and R occupancies of less than 51 occupant load and all other occupancies.**

Table 3-4 summarizes the timetable for implementation of ordinance Option 5 (arranged by building occupancy class).

3.7 Project Synopsis and an Introduction to Ordinance Options

The City of Ventura is considering how to achieve more complete compliance with State law that requires all governmental jurisdictions to inventory unreinforced masonry structures and develop programs to minimize the life safety hazards of these buildings. The City of Ventura has completed the inventory phase of compliance and has a minimal program in place where hazardous building notices were sent to property owners and title companies and recorded with the County Recorder. The City is presently evaluating how best to structure and implement a mitigation program to reduce hazards to the maximum extent feasible. Feasibility is not defined without reference to the economic impacts of requiring owners to upgrade their buildings. In developing a mitigation program, the City evaluated a broad range of alternatives ranging from mere recorded notification to building owners of a hazardous condition to mandatory structural modifications to achieve enhanced life safety protection in the event of a moderate to severe earthquake.

After studying the problem for several years, City staff proposed adoption of an ordinance that would require building owners to upgrade their structures to **Level II** standards (defined in a draft model ordinance). Implementation of these mandatory upgrades would have occurred over a five to ten year period. In view of the public controversy and opposition to this proposal, the City Council acted on (through the first reading) a proposed **Level I** ordinance with time frame variations which differed from time frames in the staff recommended option. Prior to the second reading of the **Level I** ordinance as modified by City Council and based on public opposition and concerns regarding the adequacy of CEQA review, the matter was remanded for CEQA analysis. Notifications to property owners were sent to assure minimal compliance with State law. The EIR was commissioned to study the five ordinance options considered by the City Council and additional alternatives. Alternative mitigation programs and ordinance strategies are considered throughout this document and summarized in Chapter 12.

Variations in Mitigation Programs in California

Earthquake hazard mitigation programs for unreinforced masonry buildings typically consist of local ordinances with both technical and administrative provisions. The technical provisions specify the seismic retrofit standards that the buildings must meet, and the administrative provisions establish procedures, set priorities, and specify the time allowed for building owners to comply with the seismic retrofit standards.

TABLE 3-4

PROPOSED OPTION 5 TIMETABLE FOR UPGRADING UNREINFORCED MASONRY BUILDINGS (IN MONTHS)						
BUILDING CLASSIFICATION	OCCUPANCY	TIME FOR CITY TO ISSUE CORRECTION ORDER (1)	SUBMIT STRUCTURAL ANALYSIS & PLANS (2)	OBTAIN BLDG. PERMIT (2)	COMMENCE CONSTRUCTION (2)	COMPLETE CONSTRUCTION (2)
CLASS I	A AND E OCCUPANCIES	48	9	12	18	30
CLASS II	B AND R OCCUPANCIES OVER 144 OCCUPANT LOAD	60	9	12	18	30
CLASS III	B AND R OCCUPANCIES 90-144 OCCUPANT LOAD	72	9	12	18	30
CLASS IV	B AND R OCCUPANCIES 50-89 OCCUPANT LOAD	84	9	12	18	30
CLASS V	B AND R OCCUPANCIES LESS THAN 50 OCCUPANT LOAD AND ALL OTHER OCCUPANCIES	96	9	12	18	30

(1) Measured from effective date of ordinance

(2) Measured from date correction order is served

The types of mitigation programs currently established in a selection of Cities in California are summarized in **Table 3-17.** These programs can be partitioned into four categories: **mandatory strengthening programs, voluntary strengthening programs, notification-only programs, and other programs.**

The most common types of programs adopted since the passage of the Unreinforced Masonry Law are based on the City of Los Angeles Division 88 ordinance, which is also the basis for the State Model Ordinance that is considered in this EIR as a **Level III** upgrade. **Mandatory strengthening programs** require building owners to strengthen their buildings within established timeframes ranging from one to more than seven years, depending on the number of building occupants and other variables. The Seismic Safety Commission updated its recommended model ordinance in February 1990 to incorporate improvements to Division 88 as recommended by the Structural Engineers Association of California and the California Building Officials. These modifications, plus other modifications made late in 1990, comprise the **Level III** option considered in this EIR.

Nine partial strengthening mandatory programs were adopted before the passage of the State's Unreinforced Masonry Law in 1986. Cities in this category include Los Angeles, Long Beach, Santa Rosa, Sebastopol, Gardena, Huntington Beach, Morgan Hill, Santa Ana, and Santa Monica. Summary descriptions of some of these programs are provided in **Table 3-5. Inspection of this table reveals several broad, statewide trends including:**

- **the array of programs adopted include a broad range of compliance efforts ranging from the adoption of stringent design standards to voluntary participation in upgrading;**

- **cities situated in the more capital intensive and urban settings in California have more consistently adopted mandatory strengthening programs than jurisdictions in less developed, less wealthy areas;**

- **cities or counties with a relatively few number of buildings have tended to adopt less stringent (and often voluntary compliance) programs;**

- **a very broad range of strengthening standards have been adopted;**

- **many jurisdictions have done relatively little to assist in financing or coordinating upgrade efforts other than providing zoning incentives and building permit fee exemptions.**

Other conclusions regarding statewide trends will be presented in other Chapters in the EIR. A review of this table should provide the reader with a brief synopsis of current mitigation program planning efforts against which to judge the program being contemplated by the City of Ventura.

Program Descriptions

Often modeled after the City of Palo Alto's program, **voluntary strengthening programs** establish seismic retrofit standards for unreinforced masonry buildings, require owners to prepare an earthquake hazards evaluation report, and require building owners to prepare a report that states how the building owner intends to reduce building hazards. The reports are made available to the public and the owners' hazard reduction actions are monitored by the building official and reported to the local governing body. For voluntary strengthening programs to be effective, planning, zoning, and other incentives are necessary to encourage building owners to reduce their hazards.

The least effective type of program being adopted in the State, the **notification program,** consists merely of a local government notification to building owners via a letter indicating that their buildings are potentially hazardous and are known to perform poorly in an earthquake.

Table 3-5

Description of a Sample of Unreinforced Masonry
Hazard Mitigation Programs in California

City or County	Adoption Date	Number and Type of Bldgs.	Type of Mitigation Program	Technical Mitigation Standards	Remarks
Arroyo Grande	1/1/90	25 URM	Mandatory strengthening	1987 Edition Uniform Code for Building Conservation Appendix Chapter 1.	Reduced permit fees, extended time limits, non-conforming building use permitted.
Berkeley	12/29/89	587 Buildings, all pre-1976 Assembly, Business, Educational, Hazardous, and Residential with 5 or more units.	Notices to owners	None	City established a one time fee of $22 on all business licenses to recover costs and has directed the staff to develop a hazards evaluation ordinance to be followed by a mandatory strengthening ordinance pending the availability of State and Federal financing.
Culver City	2/9/87	65 URM	Mandatory strengthening	1982 Edition of Division 88 Los Angeles City Code	
Fullerton	2/7/90	125 URM 220 Tiltup Concrete	Mandatory strengthening	1987 Edition of the Seismic Safety Commission Model Ordinance for URM buildings, certain 88 UBC sections referenced for tiltup construction.	Separate ordinance requires retrofit of pre-1973 tiltup buildings.
Highland	12/12/89	35 URM, Pre-1935 w/100+ Occs., Pre-1976 w/300+ Occs.	Voluntary strengthening	1987 Edition of the Uniform Code for Building Conservation Appendix Chapter 1 for URM Bldgs. 1973 Edition of the UBC for Non-URM Buildings, 1985 UBC.	

City or County	Adoption Date	Number and Type of Bldgs.	Type of Mitigation Program	Technical Mitigation Standards	Remarks
Long Beach	6/29/71	650 URM bearing and nonbearing wall bldgs all pre-1934	In 1959, the building official was given the authority to abate parapet and appendage falling hazards; in 1971 a mandatory strengthening ordinance was passed, which was amended in 1976.	1970 Edition of the Uniform Building Code, proposed ordinance changes are based on the latest proposed ICBO code change for URM bldgs, and a base shear not to exceed 13 percent but varies with period, building type and occupant load.	City is currently considering technical amendments to the retrofit standards of their ordinance. City is creating a special assessment district to issue bonds for seismic retrofit.
Los Angeles City	2/13/81	7077 bearing wall bldgs, 1102 non-bearing wall URM bldgs - of those 114 are historic	Mandatory strengthening for bearing wall URM bldgs, notices to owners for non-bearing wall URM bldgs. $376 million in general obligation bonds approved in June for seismic retrofit of bridges and municipal bldgs.	1988 edition of Division 88, currently under consideration for technical amendments which would require parts of the ABK Method, in particular demand/capacity and displacement checks for diaphragms, RGA #1-87 is also allowed (based on the ABK method.	A mandatory strengthening revisions program for non-bearing wall URM bldgs is anticipated by mid 1991, a survey of nonductile concrete bldgs will begin in 1990. 17 percent of the bearing-wall buildings have demolished or vacated, 35% in full compliance 4% anchors only, 15% under construction, 12% under permit 6% with plans submitted, 11% no proress.
Los Gatos	11/6/89	21 non-historic URM 6 historic URM	Mandatory repair and retrofit for all damaged URM bldgs, engineer's analysis is required for undamaged URM bldgs a subsequent ordinance requires mandatory strengthening for undamaged URM bldgs.	1987 Edition of the Uniform Code for Building Conservation as modified for URM, 75% of the 88 UBC for the repair of earthquake damaged non-URM bldgs, Chapter 37 of the 88 UBC for chimney repair.	Revocation of occupancy for buildings that do not comply with deadline. City allows replacement of damaged buildings without providing more parking.
Milpitas	1/1/90	5 URM	Mandatory strengthening	1987 Edition Seismic Safety Commission Model Ordinance, 1988 Edition of the Uniform Code for the Abatement of Dangerous Bldgs.	Strengthening deadline is negotiable depending on owner's financial situation.

City or County	Adoption Date	Number and Type of Bldgs.	Type of Mitigation Program	Technical Mitigation Standards	Remarks
Monterey	2/20/90	60 URM	Voluntary strengthening, historical buildings exempt	Similar 1987 Edition of the Uniform Code for Buildign Conservation Appendix Chapter 1, 1988 UBC for base shear.	
Newport Beach	12/11/89	124 Non-historic URM, 3 historic URM	Mandatory strengthening	Current Edition of the Uniform Code for Building Conservation.	
Palo Alto	1/20/86	49 URM, 29 Pre-1935 bldgs with 100 or more occupants, 21 pre-76 bldgs with 300 or more	Voluntary strengthening	UCBC Appendix Chapter 1 for URM Buildings, 1973 UBC for non-URM buildings	Additions to strengthened buildings are allowed, parking requirements are waived.
Rancho Cucamonga	3/21/90	22 Non-historic URM 18 historic URM	Mandatory strengthening	1982 Edition of Division 88 Los -Angeles City Code, State Historical Building Code as modified	A pamphlet explaining various options and incentives, CDBG funds for design consultation, redevelopment funds, City considering a local bond program, encourages Mills Act, allows fee waivers.
San Bernardino City		400 URM	Mandatory	1982 Edition of Division 88 Los Angeles City Code	
San Francisco	12/29/90	2080 URM (bearing wall only)	Notices to owners, seismic retrofit required upon increases in occupancy, alterations or additions	1973 Uniform Building Code force levels Repairs of earthquake damaged URM buildings to unadopted standards similar to Los Angeles Division 88	A task force has been formed to recommend ways to expand current mitigation program. An environmental impact study is in progress. An ordinance is expected by end of 1990. Plans to inventory and include non-bearing wall URM buildings have been delayed.

City or County	Adoption Date	Number and Type of Bldgs.	Type of Mitigation Program	Technical Mitigation Standards	Remarks
San Mateo County	3/2/90	3 non-historic URM 4 historic URM	Voluntary strengthening, engineer's structural report, notices to owners, Change to use/ occupancy, demolition	1985 Edition of Division 88, 1973 UBC for non-bearing wall URM buildings, State Historical Building Code	Program does not include an ordinance; recommends strengthening within three years, otherwise a mandatory strengthening ordinance will be considered.
Santa Barbara City	8/15/90	203 URM	Mandatory strengthening, implemented in a district by district manner	Modified 1987 UCBC Appendix Chapter 1, H/T ratios and in-plane shear may be modified for moderate risk buildings	Holding a seminar for contractors and building inspectors.
Santa Barbara County	1/2/90	37 Non-historic 4 historic URM	Notices to owners, mitigation required upon change of use or occupancy	None	County reviewing other mitigation proposals.
Sunnyvale	10/31/89	86 URM	Notices to owners. Educational material, voluntary engineering reports, review by city after one year	None	
Torrance	12/15/87	50 URM	Mandatory strengthening. 85% of the bldgs have or are in process of retro-fit	1982 Edition of Division 88 Los Angeles City Code	City funded a subsidy to pay for the engineering analysis at $0.50/sq.ft. Formed $679,000 assessment district for owners who choose to join.
Upland	12/11/89	58 URM, Pre 1935 w/100 + occs Pre 1976 w/300 + occs	Voluntary strengthening requires engineering reports and letters of intent	Latest Edition of Division 88 of the Los Angeles City Code and the 1973 UBC for non-URM buildings	$2 million Commercial Rehab. Loan Prpgram-loans at market rate. Architectural Engineering and loan packaging.
West Hollywood	12/18/89	Mandatory strengthening	1988 Edition of Chapter 96 of the Los Angeles County Code as modified, also accepts the 1984 ABK Methodology Report	Amended the rent control program to allow rent increases $7100 per bldg CDBG funds, housing rehabilitation program of $10,000 per building, reduction of waiver of fees, zoning incentives.	

Most jurisdictions with this type of program are contemplating more comprehensive measures, since building owners are not provided encouragement, alternatives, or seismic retrofit standards and little voluntary strengthening follows such notification.. Notification only programs have proven to be ineffective for reducing earthquake hazards and they are troublesome for cities and building owners alike. Such programs are usually an interim step towards establishing more effective programs. Furthermore, the Seismic Safety Commission has stated that such programs do not meet the intent of the law, which is to provide local governments with the flexibility to develop unique yet effective hazard-reduction programs.

There are a number of cities that have adopted programs that are in some cases variations of the preceding strategies. The cities of Bishop, Clearlake, La Verne, Lakeport, Ukiah, and Willits and Lake County have passed ordinances that require the placement of placards on unreinforced buildings that warn occupants and passersby of the hazards.

San Francisco has a program that requires seismic retrofits only if major additions or alterations to buildings are planned. This ordinance has had only a limited effect in reducing earthquake hazards because it discourages improvements to buildings as well as seismic retrofits. Two jurisdictions have relied on demolition to eliminate their relatively few hazardous buildings.

The advantages and disadvantages of the major different types of ordinance programs being adopted statewide are summarized below. **The City of Ventura opted for the adoption of a mandatory strengthening program and this EIR was prepared to assist in the selection of proper upgrade standards.**

Mandatory Strengthening Programs

Program Description

- o Requires owners to reduce earthquake hazards within established timeframes.
- o Timeframes for compliance start when an order is issued by the Building Department.
- o Establishes seismic retrofit technical standards.
- o Sets a goal of hazard reduction - not total elimination of the hazards.
- o Provides for appeals.

Advantages

- o Local governments can effectively enforce the program and reduce hazards.
- o Building departments can monitor and report progress.
- o Building departments can control compliance rates by slowing down or speeding up the issuance of orders to building owners.
- o Compliance rates vary with the number of building occupants, with longer timeframes for smaller buildings.
- o Most other local governments have similar programs.

Disadvantages

- o Imposes arbitrary and at times inflexible deadlines on building owners.
- o Compliance schedules do not necessarily reflect the limits of the local design and construction industry resources.
- o Can impose economic hardships on owners and occupants.
- o Compliance schedules do not consider hazards to passersby or hazards from adjacent or unoccupied buildings.

Voluntary Strengthening Programs

Program Description

- o Requires owners to prepare hazard evaluation reports.
- o Requires owners to write letters that indicate their intentions to reduce hazards.
- o Reports and letters are made available to the public.
- o Establishes seismic retrofit technical standards.
- o Owners set their own timeframes for compliance with standards.

Advantages

- o Provides effective disclosure of hazards to owners and the public.
- o Flexible timeframes for compliance can result in fewer economic difficulties.
- o Rates of hazard reduction can vary depending on owner's resources and demands on the design and construction industry.
- o Provides an effective management and monitoring system to local governments.
- o Local governments can always reconsider the program's progress and impose mandatory requirements if it is ineffective.

Disadvantages

- o Effective in reducing hazards only if coupled with strong economic environments, and financial, planning, and zoning incentives.
- o Not effective with owners who choose not to cooperate and thus can be unfair to cooperative owners.
- o May prolong overall hazard reduction efforts and earthquake risk exposure.
- o Owners must pay higher fees to design professionals.
- o Does not consider hazards for occupants and passersby or from adjacent buildings.

Notification Only Programs

Program Description

o Owners are notified by letter that their buildings are potentially hazardous.

Advantages

o Some local governments state that it meets the minimum intent of the Law.

o Minimal initial cost to local governments.

o No direct cost to owners who choose to ignore hazards.

o Can be effective if owners are few and cooperative and if governments adopt seismic retrofit standards.

Disadvantages

o Programs have been ineffective in reducing earthquake hazards.

o Owners are not protected from future code changes if they choose to reduce hazards.

o Owners are not encouraged to consider hazard reduction.

o Owners are not informed of specific hazards and are likely to react with disbelief.

o Local government cannot easily monitor hazard reduction progress.

o Imposes demands on local governments to deal with unhappy owners.

o Seismic retrofit standards are typically not adopted.

An Introduction to Strengthening Alternatives Considered in this EIR

In response to information obtained as a result of study of the Loma Prieta quake (and other factors), the scope of work for the EIR was expanded to include not only a **Level I and II** upgrade, but also **a Level III** upgrade, an option based on the Seismic Safety Commission promulgated "State Model Ordinance." To evaluate what course of action should be taken by the City, the EIR consultant was directed to study all prior ordinance proposals and all other reasonable options. As a result, the scope of the analysis was expanded to include more than seven other upgrade options (which are described and discussed in Chapter 5). **The project defined in the EIR is very broadly conceived: adoption of an ordinance to upgrade unreinforced masonry buildings. Upgrade programs ranging from Level I through Level III (and beyond) are considered throughout the document. The following very brief summary statements describe the main features of each types of strengthening program:**

o A **Level I** program involves anchoring the walls, securing the parapets, and shear connection of roof and floor structures at the building diaphragm edges. This upgrade (sometimes referred to as anchors and ties) would require a relatively low level of strengthening. Typically, this work would be confined to perimeter walls although strengthening would also be required of unreinforced interior walls in larger buildings and in buildings with unsatisfactory wall height to thickness ratios.

o A **Level II** program involves the basic **Level I** strengthening activities plus additional strengthening for buildings with any of the following conditions: an open store front, an open store front with a second floor, and excessively high but thin walls (an excessive height:thickness ratio).

- o A **Level III** program, similar to the Los Angeles retrofitting ordinance, would require **Level II** strengthening in many cases plus additional work on most buildings involving roof and floor strength upgrading and in-plane strengthening of exterior walls. The design standard for this work would be the Uniform Code for Building Conservation Appendix Chapter 1 and Special Procedure incorporated into the most recent version of the State Model Ordinance (1990). The in-plane strengthening requirement represents a significant increase in construction requirements over Level I standards. Generally, the **Level III** construction program would exceed the disruptions of a major remodel and it is likely that extensive removal of finishes, installation of plywood shear wall, restoration of finishes and possibly installation of structural steel would be required. Recently adopted AB 204 mandates incorporation of this standard into local building codes (effective July, 1993).

- o A **Level IV** program (which is only discussed very briefly) would require very considerable strengthening beyond the **Level III** standard. The design standard for this level of upgrade would be the 1988 Uniform Building Code (current code requirements for new buildings). Nearly all buildings would be required to add additional framing, to replace roof and floor members and surfaces, and to strengthen exterior masonry walls through the application of gunnite, shotcrete, or some other procedure. The **Level IV** standard is well in excess of **Level III** standards and represents a significant escalation of construction over other standards. In many cases, in addition to building strengthening work, new foundations would also be required. **From the outset, it should be understood that the costs of implementing this Level of upgrade are probably prohibitive for buildings located within the City of Ventura. This option is discussed briefly to demonstrate the level of effort needed to achieve virtual assurance of building damage reduction and complete life safety protection.**

Specific strengthening construction required for each level of upgrade is described in Chapter 5 and the building damage reduction and life safety effects of implementing each option are discussed in Chapter 7. **In summary, even though the Project Description is a proposal to adopt one of the options presented in this Project Description, other alternatives have been studied in sufficient detail to enable implementation of another option if the City decides a multi-level strengthening program (or some other option) is desirable.** The State Model Ordinance structural requirements are contained in the EIR Technical Appendix.

CHAPTER 4

ENVIRONMENTAL SETTING

Revisions to the Final EIR in Response to Comments on the Draft

Other than minor editorial changes and corrections in graphics included in this chapter, few revisions were necessary in response to comments.

4.1 Regional Setting, Physical Environment, and Cultural Setting

The City of Ventura is located in western Ventura County along the coast of the Pacific Ocean. U.S. Highway 101 provides regional access to the City from Santa Barbara and Los Angeles Counties. State Route 33 provides a connection with the Ojai Valley, and State Route 126 links the City with Santa Clara Valley. Secondary access is provided from the Ojai Valley by Ventura Avenue, from Oxnard by Victoria Avenue, and from Santa Paula by Foothill and Telegraph Roads. The City is situated on a plateau or terrace located between the foothills and the Santa Clara and Ventura Rivers. Portions of the City extend north into the foothills. Topography of the terrace varies in elevation from 20 feet above sea level near the coast to 400 feet near the base of the foothills.

Open lands and agricultural properties surround the City separating it from nearby communities. The City's western limits are bounded by the Ventura River and terraced foothills. The Ventura foothills border the northern City limits and the eastern boundary of the Ventura Avenue area. Agriculture (primarily grazing) and oil extraction activities are the only land uses in the foothills outside of the City limits. Agricultural uses, primarily citrus/avocado orchards, border the City on the east separating the City from Santa Paula which is located 8 miles to the northeast. Orchards and row crops, agricultural uses and the Santa Clara River border the southern City limits, separating Ventura from Oxnard; however, Ventura and Oxnard share a common boundary at the river mouth. The ocean borders the City on the southwest.

The Ventura foothills provide a scenic backdrop to the City and in certain areas, scenic vistas of the City, ocean, Ventura River valley, and Oxnard coastal plain. Most of the foothill environment is presently in open space; vegetation consists of annual grasses with scattered pockets of coastal sage scrub. The visual diversity of the foothills is defined by the moderate variations in topography and the extensive open spaces, augmented by the seasonal color contrast of the annual grasses from winter/spring to summer/fall. Some residential development extends onto the flanks of the hills providing panoramic views from many homes.

As shown in **Figure 4-1, Unreinforced Masonry Building Locations in the City of Ventura,** the majority of the unreinforced building stock is situated either in the Downtown central business district and, more specifically, in highest concentration in the older, intensively developed, Main Street Corridor. This pattern of distribution is typical of unreinforced building locations in other California cities. The basic historic and cultural fabric of the City of Ventura and the commercial evolution of the City is described in chapter 9 of the EIR (Cultural and Visual Resources). The landscape and urban design setting of the one area where most of the unreinforced building stock is concentrated (The central business district and the Main Street corridor) are distinctly urban streetscapes. The Main Street corridor area has, to a considerable degree, retained the basic configuration and streetscape scale of the era of its inception (despite the extensive use of recent veneers). This difference in scale and degree of Modernist influence is obvious even based on casual inspection of these two portions of the City.

The dominant modifications that have occurred in both the Downtown generally and the Main Street corridor specifically relates to the gradual transition of architectural styles that have modified or diminished the visibility and significance of the City's architectural history. The decline in the aesthetic quality of the urban environment in Ventura since the early 1940's is evident in a review the progression of air photos that exist documenting the City's development. Dominant modifications from historic patterns and identified aesthetic problems relating to unreinforced masonry buildings are described in chapter 9.

Community Aesthetics and Unreinforced Masonry Architectural Values

Each city and region is characterized not only by its natural environment but by the history of its man made environment and architecture. **To the degree feasible, it is important to preserve the relationship between the older portions of Ventura's Downtown and Main Street corridors where unreinforced buildings are concentrated.** This historic City core area is very small in relation to the City's present boundaries but this area has much greater time depth and architectural diversity than any other surrounding urbanized areas. This time depth preserves the essential architectural history of the community.

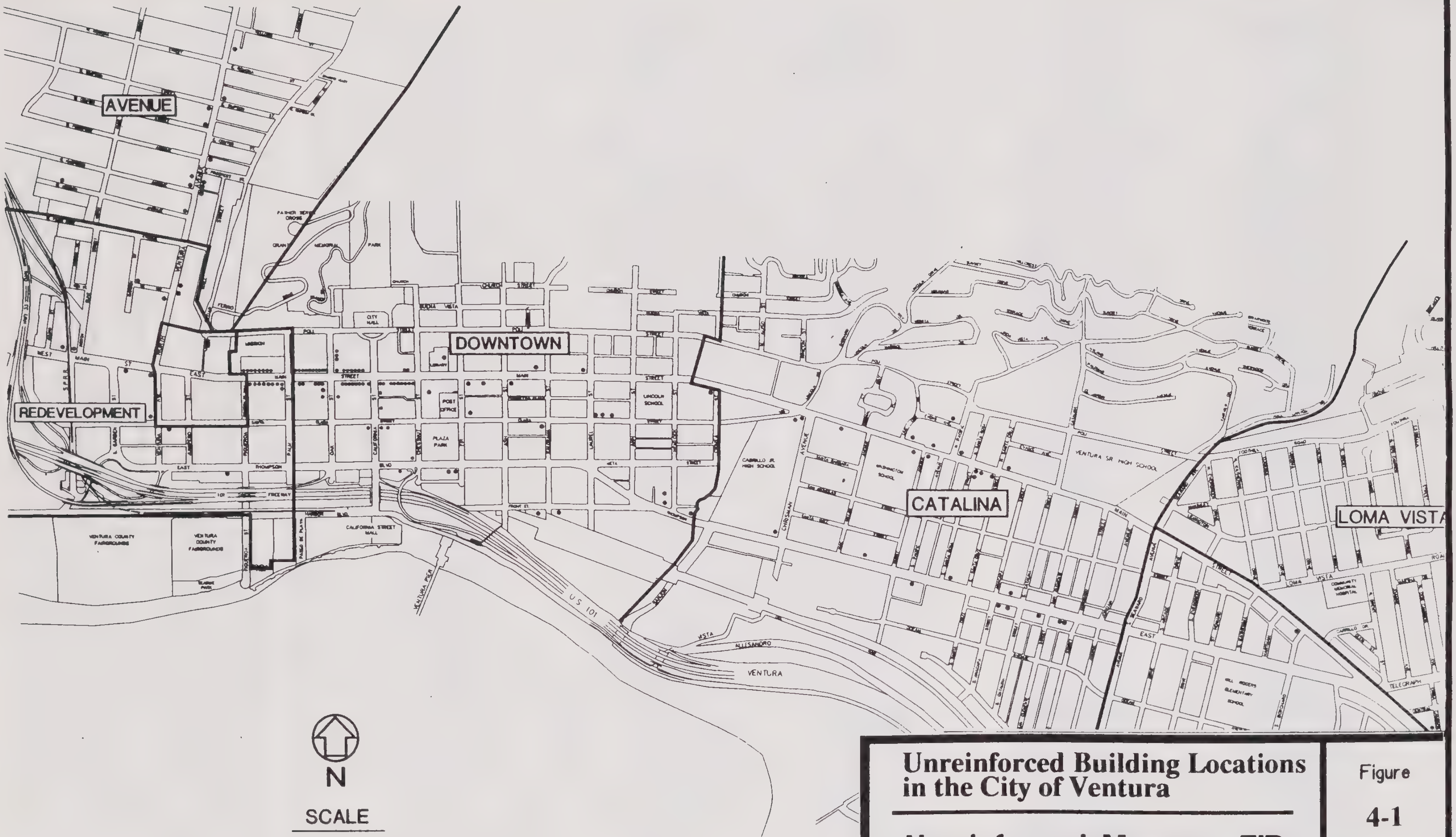
Although land uses may change through time, the sense of aesthetic integration and continuity in architectural development must be encouraged. The Main Street corridor is one of the oldest portions of Ventura and as such this area contains a record of the aesthetic development and architectural heritage of the City, and, in a broader, regional context, the heritage of California's architectural development.

Such 'old town' areas are being redeveloped in many parts of California without due consideration for the heritage of architectural forms that are unique to California prior to the advent of Modernism and Post Modernism. Since World War II, distinctive regional California architecture has been broadly replaced by buildings designed in accord with Modernist principles which are reflected in large scale suburban developments with simultaneously designed commercial and retail that are undistinguished from one another and from one community to another.

Since World War II, much of the housing stock and commercial/industrial development throughout California has been created by individuals living outside of the communities where new construction has occurred. This trend is a significant departure from the way both homes and businesses were conceived and built in the 18th, 19th, and early 20th centuries; during these time periods, usually a home builder or local merchant resided in the community where he/she did business or lived. In recent years, the architectural heritage of the community has been considered less closely in conceiving both home and commercial developments. Moreover, the building industry has changed and the approach to development has shifted since World War II to producing homes and commercial structures to maximize investment return, a reasonable economic goal. However, as a result, building detailing, custom construction, and regional design considerations have been generalized, minimized, or eliminated. With the decline in unreinforced masonry construction in the late 1920's and the evolution of concrete building fabrication and modernist principals, this process of decline in detailing has accelerated. As reflected in recent public comments on several large scale projects and the Downtown Specific Plan which is currently being formulated, **there is considerable concern about the gradual replacement of the community's architectural heritage by undistinguished structures which ignore the community's uniqueness and established architectural styles.**

Architectural Setting

There are essentially five different architectural manifestations in the portions of the City where unreinforced structures are located which are related to the historic development of the community of Ventura. These themes (Spanish/Mediterranean/Colonial Revival, Art Deco, California Bungalow, Queen Anne, and Victorian, Classic Revival and early Modernist) provide important organizing principals for considering the diversity of styles available for approaching the solution of aesthetic problems. Unreinforced masonry structures constitute an important component of the City's inventory of historic buildings. **However, most of these buildings with street frontage on major City streets have been modified very considerably since their original construction. With several important exceptions, stucco finish work has been used to face most of the unreinforced buildings in the core downtown area and along Main Street where some of the architecturally and historically most significant unreinforced buildings are located.** Most of these unreinforced buildings are not readily distinguishable from other types of construction due to the gradual replacement of original building details and finish surfaces with more recent surfaces.



Unreinforced Building Locations in the City of Ventura

Unreinforced Masonry EIR

Figure 4-1

The **PLANNING CORPORATION** *of Santa Barbara*

In many of these buildings, the original brickwork has been completely obscured and, with the exception of the distinct window proportions and shapes characteristic of unreinforced buildings, many of the structures in the inventory could not easily be identified as historically significant or architecturally unique. **The buildings in the first block of Main Street east of Figueroa have more successfully retained more of the original facade detailing and brick veneer work that distinguishes unreinforced structures.**

Planning Communities and Unreinforced Masonry Buildings

For planning purposes, the City has been partitioned into Planning Communities that reflect the historic character, development history, and evolving land uses characteristic of the City. Although the inventory of unreinforced masonry buildings in the City is concentrated in the Downtown Community, some structures are located in other Planning Communities north and east of the downtown area. A brief description of each Planning Community where these buildings are located is provided in the following section.

Downtown Community

In addition to its importance as the historic center of the City, the Downtown Community has a unique physical setting. Situated between the Pacific Ocean and the foothills of the Coast Range, the existing land use patterns in the Downtown Community include a wide range of somewhat incompatible uses. The City is currently attempting to relocate heavy industrial uses in this Community to more appropriate sites in order to create a desirable environment for the rejuvenation of existing residential areas and to encourage new residential development as well as tourist oriented and general commercial uses. Historically and architecturally significant buildings are present throughout this Community and the City has refurbished some of these structures to take advantage of the City's unique historic character and to maintain design continuity with the past. The preservation of architectural resources and the elimination of land use conflicts are basic planning goals for this area. The stated intent of the Redevelopment Plan for this Community is to enhance the downtown area as a residential and commercial center. In order to emphasize the historic significance of the entire Downtown area, an "H" (Historical) overlay has been placed on the land use map for this Community. **This Community has the largest number of unreinforced buildings in the City. Many contiguous buildings with shared (party) walls are present along Main Street in the vicinity of the Mission. The Downtown area also contains the greatest diversity of building styles, shapes, and construction techniques.**

Avenue Community

The Avenue Community is characterized by a mix of residential, commercial, industrial and institutional uses. There is a large concentration of heavy industrial uses, which constitutes a significant percentage of the City's employment base and economy. Housing in the Avenue Community tends to be older and contributes an important part of the City's supply of affordable rental and ownership housing. In some areas, there is a mix of incompatible uses, with residential, commercial and heavy industrial uses in proximity to one another. This factor has contributed to deterioration of the housing stock and the conversion of some older single family neighborhoods to higher density multi-family uses. **Several unreinforced structures are present in the southern part of the Avenue Community.**

The Hillside Area of the Avenue Community is characterized by a mix of residential uses, industrial uses (such as quarrying and oil production), and an institutional use (hospital). Eventually, full residential development of all suitable portions of the Hillside Area within this Community will be developed. There are no unreinforced buildings in the Hillside Area.

Catalina Community

The Catalina Community is essentially developed, except for the Hillside Area. The Community has some characteristics of a transitional community; it is undergoing or likely to experience change in character. The residential areas in the hillsides, though, are viable and have unique attributes (view potential, established

residential character, winding streets, etc.). Because of the varied zoning patterns within residential areas, the presence of strip commercial activity on Main Street and Thompson Boulevard, and the varied types of both residential and commercial structures, there is considerable pressure for altering the single family character of some parts of this community. In some instances this change has already occurred or is presently occurring. **Most unreinforced buildings in this community are isolated, smaller, one story structures.**

Preble Community

The Preble Community is essentially fully developed, except for one Agricultural Use area. The general character of the Community is considered transitional -- an area where little land is available for new development, but where private redevelopment potential exists. The Preble Community has a unified neighborhood commercial center and conveniently located schools and play areas which are similar to newer neighborhoods in the eastern part of the city. **There are several, small unreinforced buildings in this Community.**

Loma Vista Community

The Loma Vista Community is characterized by a large concentration of regional medical facilities and related professional offices such as the Ventura County Medical Complex and the Community Memorial Hospital, several large medical clinics, and numerous small professional offices and related commercial businesses. In the fringe areas bordering these medical facilities, many residential structures have been converted to office uses. **One unreinforced building is present in this Community.**

4.2 Unreinforced Building Locations in the City

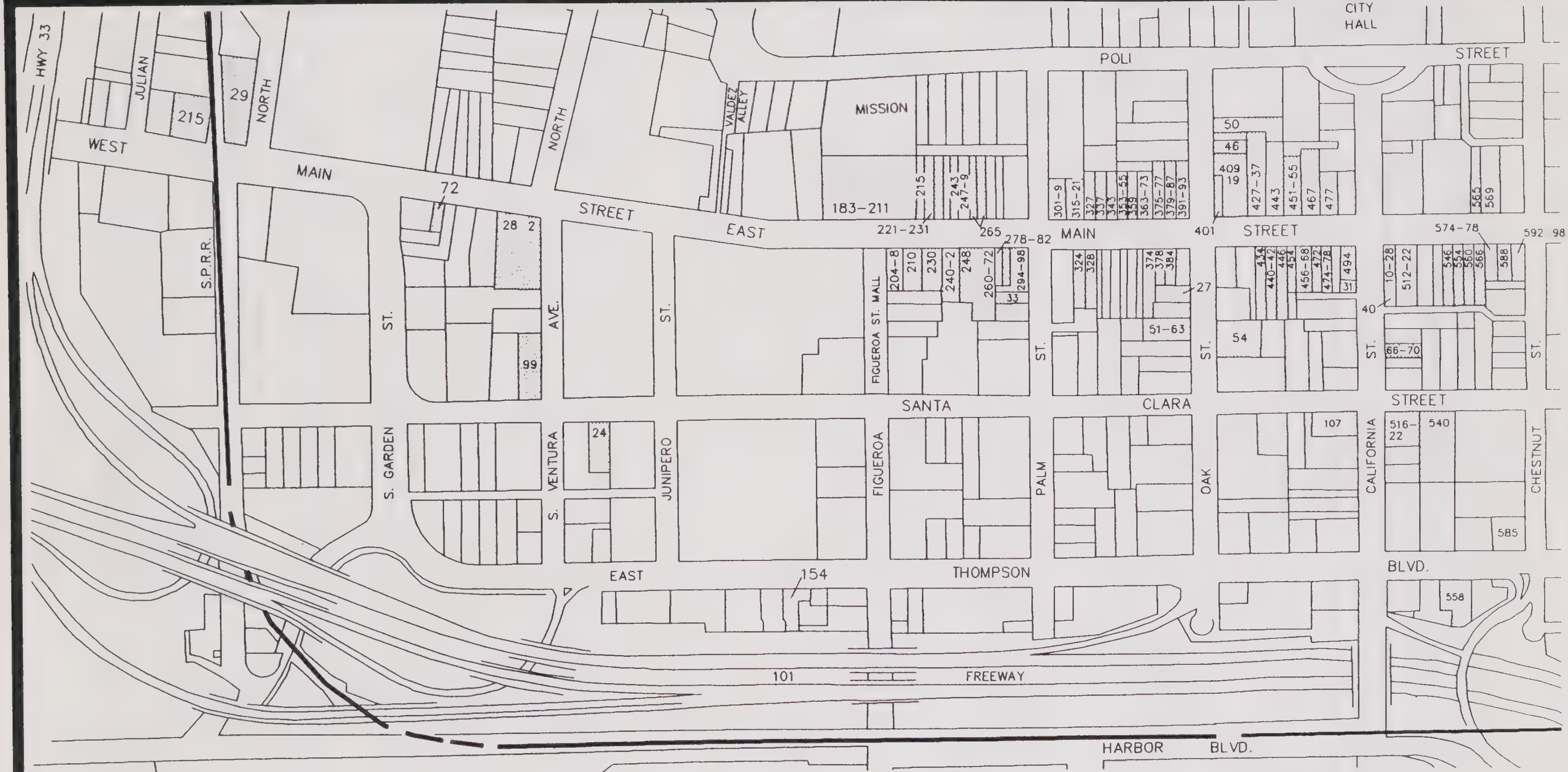
As revealed in the **Figures 4-1,** the densest concentration of unreinforced masonry structures in the City are located along Main Street between Figueroa Street and Chestnut. Many of these structures are literally attached to one another through the use of shared (party) walls. As illustrated in **Figure 4-2,** The area of highest density unreinforced building concentration is between Figueroa and Chestnut along Main Street. This area is referred to as the Main Street Corridor in the EIR.

In contrast, unreinforced buildings in the Avenue Community and in the planning communities east of the Downtown area are generally not contiguous. **The existence of the more densely concentrated, clustered inventory along Main Street in contrast with widely dispersed, generally smaller buildings in the surrounding communities is an important attribute of the Ventura building stock. This attribute was of considerable importance in formulating a recommended strengthening program for the City.** The physical attributes and general characteristics that define this building inventory are discussed in chapters 5 and 7 of the EIR and detailed descriptions of each structure are provided in the Technical Appendix to the EIR.

4.3 Ordinance Programs in Other California Cities

A Survey of Recent Ordinance Development Efforts in other California Cities

A number of cities in both northern and southern California have either adopted unreinforced masonry upgrade ordinances or are currently discussing how proposed ordinance requirements should be implemented. The occurrence of the Loma Prieta earthquake has enhanced the earthquake awareness of City governments statewide and has provided an understanding of the compelling need to implement, in a timely manner, seismic upgrade programs for masonry buildings. The cities of Watsonville and Santa Cruz, both of which sustained major masonry building failures resulting in fatalities in the recent Loma Prieta quake, were in only a preliminary state of upgrade planning. Both jurisdictions had completed inventories of unreinforced structures several months prior to the earthquake and neither City had adopted any upgrade requirements.



N

SCALE

500 FEET

BUILDING LOCATIONS DOWNTOWN COMMUNITY/ REDEVELOPMENT AREA

Unreinforced Masonry EIR

Figure **4-2**

The PLANNING CORPORATION of Santa Barbara

According to the Seismic Safety Commission (June 1990 Seismic Risk Mitigation Compliance Report) more than 60% of the jurisdictions affected by the State unreinforced masonry law have adopted some form of mitigation program to comply with current legal requirements. Of this number, a majority have adopted formal upgrade ordinances, some have instituted notification procedures to building owners and title companies and required structural evaluations, a small number of jurisdictions have required notification of building owners only and no further remedial actions, and more than 20 jurisdictions have required mixed strategies. **The development of programs specifically designed for individual jurisdictions is encouraged by the Seismic Safety Commission. Table 3-17 contains a synopsis of the range of actions that have been undertaken by jurisdictions throughout the State of California.**

Several jurisdictions in Southern California have proceeded apace with improving the safety of unreinforced structures. The City of Los Angeles adopted a Comprehensive Mitigation Program Ordinance in 1981. This ordinance is well known statewide and served as the basis for the Model Ordinance provided to jurisdictions by the State Seismic Safety Commission. This Los Angeles ordinance (known as "Division 88") requires rehabilitation of all unreinforced masonry structures to minimum 1970 seismic code standards within 6-15 years of the date of ordinance adoption depending on the occupant load of a building. Following the Mexico City earthquake in 1985, the original ordinance time constraints were accelerated by approximately one year. The Los Angeles ordinance was challenged in court and found by an appellate court in 1984 to be a constitutional exercise of City police powers. Los Angeles City and/or County had an estimated 6,000 buildings subject to the ordinance; the upgrade program is now proceeding on schedule.

Long Beach adopted the first comprehensive seismic mitigation program for older masonry structures in the nation in 1971. After several reconsiderations and some minor modifications, the Long Beach program is now proceeding on schedule. After implementation of the program, Long Beach now has an estimated 500 remaining unreinforced structures in the City; about 300 buildings have been demolished since ordinance adoption. Many of the structures that have been demolished and removed in Long Beach were displaced through downtown redevelopment expansion activities.

Culver City, which has about 60 masonry structures (including its City Hall) and the City of Torrance which has only 50 masonry buildings, both recently adopted an ordinance similar to the "Division 88" City of Los Angeles program. Torrance's program includes establishment of a "1911 Assessment District" fund to assist owners with financing the required rehabilitation costs.

Beverly Hills completed the required detailed inventory of approximately 50 masonry buildings within the City's boundary in 1989. Currently, community meetings are in progress on the scope of an ordinance and a consultant has been retained to draft a mitigation ordinance. The City of Inglewood is also in the process of a detailed review of the inventory of about 50 masonry structures in the City and planning staff is organizing community meetings on the issue. The City of Burbank, which completed the detailed inventory of approximately 80 masonry buildings several years ago has to date not yet formally adopted an upgrade ordinance. Glendale, on the other hand, completed the detailed inventory of some 600 masonry buildings and recently adopted a comprehensive seismic safety ordinance similar to the Los Angeles ordinance and Statewide model programs. Pasadena, like Burbank, has completed initial surveys of some 800 masonry structures but has no detailed inventory nor is the City processing an ordinance proposal at this time.

In the tri-counties area, ordinance efforts have evolved similar to Statewide experiences. The City of Santa Barbara has completed the mandated inventory and has adopted an ordinance requiring upgrading which is somewhat less comprehensive than the "Division 88" model. This proposal encountered legal challenges - primarily due to its alleged insufficiency, and, as in Ventura, the proposed ordinance was withdrawn and reintroduced on several occasions before passage. The City of San Luis Obispo has completed an inventory of approximately 160 unreinforced structures and is currently conducting community meetings regarding the content of a proposed ordinance. The City has just contracted with an engineering consultant to prepare a draft ordinance. The County of San Luis Obispo, which has fewer than 50 relevant structures, is currently developing an ordinance. The County of Ventura has regulatory responsibility over less than 40 unreinforced structures throughout the widely dispersed small, older communities within its boundary. The

County intends to address upgrades on a case by case basis by requiring rehabilitation to be performed over the next decade to State Model Ordinance standards.

The City of San Francisco has the daunting task of developing a program for over 2,000 structures, many of which are culturally and architecturally very important. Entire ethnic communities in San Francisco are housed in blocks of contiguous unreinforced structures. The City has completed the required inventory and has completed an EIR on a variety of ordinance options.

The State of California Seismic Safety Commission sponsored earthquake hazard reduction legislation in both 1985 and 1986 and subsequently published the Model Rehabilitation Ordinance in 1986. This model ordinance has recently been revised (1990). The Seismic Safety Commission is assisting cities throughout the State in developing and implementing many programs on seismic preparedness Statewide. This Commission, which received multi-year program authorization and appropriations in 1986, continues to encourage and compel local jurisdictions to plan and stimulate seismic safety activities throughout the State. The Commission was instrumental in participating in the adoption of the model ordinance as a uniform standard through the passage of AB 204.

Summarizing this brief review, several conclusions are apparent. Smaller jurisdictions with fewer masonry buildings have been relatively successful both in completing inventories in a timely manner and in implementing ordinances within the required timeframes specified in State law. Other jurisdictions with more than several hundred structures have met with considerable political resistance to the adoption of effective ordinances or other types of mitigation programs. Two recent occurrences have encouraged the adoption of adequate mitigation programs statewide. First, as the result of an effort by the Seismic Safety Commission to obtain the legislature's cooperation in requiring implementation of the State's Model Ordinance, several cities moved rapidly to adopt programs that were less intensive than the recommended State program and second, the Loma Prieta quake provided an additional reminder of the necessity to proceed with implementing protective ordinances. Several southern California cities, including the City of West Hollywood, have adopted mitigation programs in the past several months.

4.4 The Research Setting: Earthquake and Building Response Simulation Supplemented by the Comparative Method of Research

There are several ways to study and understand a scientific or engineering problem - and, determining what type of ordinance to adopt and evaluating what level of seismic upgrade is most cost effective are indeed scientific problems. The most effective and direct research approach to evaluating various ordinance options would be to test directly the impact of seismic shaking on several unreinforced structures which have been upgraded to different standards. This can be done either by **physical simulation** of ground acceleration with real force, which would result in the partial or complete destruction of a tested building or by a **computer simulation** based on available data, a type of activity performed with the assistance of complex mathematics. In the first case, the simulation is a literal test of the destructive capacity of a quake on buildings strengthened to different standards and in the second case, the level of destruction is only predicted mathematically. Both simulations involve models of future events and the conclusions of the modeling are expressed in statistics of probability. The models cannot assure that future events will occur exactly as simulated, but the models can predict that future seismic events and the response of buildings with different degrees of reinforcement will occur as predicted much of the time. Some individual cases may not fit the model of a real life situation - some buildings will withstand impacts better than expected and some walls may separate and collapse unexpectedly.

Statistics allow prediction of how much error of estimate will occur in a simulation of future conditions. Statistics enable the recognition that being incorrect in a prediction or an estimate is a natural and expected occurrence. What a scientist or an engineer tries to do in evaluating any problem is to minimize the error in estimation and prediction. The use of a computer model to simulate future conditions and effects has been employed in the analysis to follow.

A related method of studying a problem is loosely termed the **comparative method.** This approach is less rigorous and less mathematical. With the comparative method, contemporary or historic records are researched to reconstruct how unreinforced buildings have performed during past earthquakes. The comparative method is accurate to the degree that the record of prior experiences conform to the general conditions that one is trying to predict. The effects of the recent 1989 Loma Prieta earthquake centered in the Aptos Foothills on the downtown portion of the City of Watsonville is an excellent comparative source of information about how unreinforced structures in Ventura will respond to an earthquake of moderately severe duration and magnitude. This quake's effects on the community of Watsonville (and to a lesser extent, Santa Cruz) provide models of how an earthquake would affect downtown Ventura. The important prerequisite for using the comparative method of prediction is to demonstrate the similarity between the conditions and circumstances being compared.

Of cities in the vicinity of the recent Loma Prieta earthquake, Santa Cruz and Watsonville are more similar to Ventura than other cities in the epicenter region. These similarities include:

- **The unreinforced masonry buildings in Watsonville and Santa Cruz are concentrated in a relatively small, older portion of downtown;**
- **The central portion of these cities are surrounded by older frame structures, many of which were unanchored to their foundations; and**
- **The effected portions of Watsonville and Santa Cruz are both situated along flood plains in areas where soils are subject both to seismic wave amplification and, to a lesser degree, liquefaction.**

4.5. The Basic Question: Are Old, Unreinforced Masonry Buildings Hazardous?

The purpose of this EIR is to give a documented, carefully analyzed conclusion regarding how hazardous the building inventory is in the City of Ventura. Chapter 7 contains detailed information about the potential performance of buildings in the City of Ventura in the event of a major earthquake. The Seismic Risk Model discussed in this chapter addresses the problem of the degree to which these types of building are hazardous. There is no argument that unreinforced buildings are hazardous; the evidence of the recent Loma Prieta quake (described in chapter 8), comparative data from San Francisco and other communities (described in chapters 7, 8 and 12), and the results of the Seismic Risk Model for Ventura (chapter 7) all confirmed that old, unreinforced buildings are hazardous. The question is: how hazardous are these buildings and what degree of upgrade should be required.

The history of legislative efforts to require upgrades also provides valuable information about the hazardous nature of unreinforced buildings. In their important study of the politics and economics of earthquake hazard mitigation efforts in California, Alesch and Petak (1986) summarized the significance of this question and provided a response by reviewing the recent history of upgrade efforts. The following summary is excerpted from this study.

Ordinance Development Efforts Since 1933

The current emphasis on developing standards for upgrading unreinforced masonry buildings has taken considerable time. In the immediate aftermath of the 1933 Long Beach earthquake, architects, engineers, and other professionals formed teams to investigate the effects of the earthquake and to determine the

reasons for the extensive loss of life and property. Their purpose was to develop steps to be taken to minimize the effects of future earthquakes. Among the findings, it was noted that more than half of the 3,417 damaged buildings in the City of Long Beach had been constructed with unreinforced masonry exterior walls. Eighty six percent of the unreinforced masonry buildings affected by the quake failed in some way.

Constructing brick buildings with very little vertical or lateral reinforcement in the walls was a widespread practice in California prior to 1933. It had been a popular construction method in eastern cities in the United States and, when eastern masons moved west to California, they brought that building technology with them. Masons who employed the construction technique in southern California often made the mortar for the brick walls from beach sand; however, beach sand proved to be a poor choice because it was well worn from ages of pounding under the California surf and did not create a firm bond with the brick courses. The masons also tended to substitute large proportions of lime for cement when mixing the mortar. Lime mortar deteriorates because it leaches out when water or dampness is absorbed by the masonry wall.

The unstable nature of the mortar used by the masons, while not fully understood at the time, had been of concern to Long Beach officials prior to the earthquake, as evidenced by increasingly strict revisions to the City's building codes in 1913, 1923, and 1930. The 1913 code permitted a straight line mortar for all walls, except that isolated piers, foundation walls, parapets, and chimneys above the roof line were required to be laid up in cement lime mortar were revised upward to require additional proportions of cement. In 1930, mortar requirements were amended again to require a minimum of one part cement, one part lime, and six parts of "clean, sharp sand." The code called for workmanship employing "full joints, shoved work using wet bricks."

During the 1933 Long Beach earthquake, unreinforced masonry structures proved to be highly susceptible to the stresses imposed by lateral ground acceleration. The buildings crumbled and collapsed. In reporting on its inquest concerning the victims of the 1933 earthquake, the Coroner's Jury in Long Beach concluded:

> **"Masonry buildings were the principal sufferers and their failure occasioned the principal loss of life.** Damage was mostly confined to those buildings built with poor quality lime mortar, inadequate bonding and anchoring, or of inferior workmanship, and built to designs which took no account of horizontal forces (City of Long Beach, 1933).

In the wake of the 1933 Long Beach earthquake, architects and engineers urged policy makers to revise building laws and regulations to ensure that structures would be designed and built to withstand seismic forces to the degree this objective was economically feasible. There was also concern for strengthening existing buildings as early as the 1930s. In a report on the damage in Long Beach, the California Joint Technical Committee on Earthquake Protection noted that:

> "Compared to the large number of buildings which now exist in this metropolitan center and in other communities through the Pacific Southwest, relatively few new buildings will be constructed during the next ten years; consequently the necessity for strengthening existing buildings is more important even than a change in standards for new buildings. Insofar as the police power of the State will permit, it should be required that all privately owned existing buildings be made earthquake resistant. Strengthening of public buildings, however, is subject to the will of the people, and there should be no delay in making these buildings--particularly school buildings--safe (1933).

The concern generated by the Long Beach earthquake and the recommendations of the various organizations that studied its effects resulted in the adoption of legislation by the State of California that came to be known as the Field and Riley Acts. On April 10, 1933, the Field Act vested the Division of Architecture, California Department of Public Works, with the authority and responsibility to approve or reject plans and specifications for all public school buildings, except those specifically exempted, and to supervise their construction. The Riley Act, enacted a month later on May 23, 1933, required all buildings

built after that date to be constructed under far more rigorous standards than had been previously considered necessary. On October 6, 1933, the City of Los Angeles adopted earthquake-resistant measures in its building code for new construction. Long Beach followed suit in January, 1934. **Thus, after about 1933, the reinforcement of brick structures was required by building codes.**

The Sylmar-San Fernando Valley quake of 1971 produced unreinforced building failures similar to the 1933 Long Beach. Almost one-half of the pre-1934 buildings that were affected by the quake suffered moderate to major damage. Some unreinforced masonry buildings in downtown Los Angeles (as far as 25 miles from the earthquake epicenter) were damaged. The majority of the persons killed occupied one the Veterans' Hospital buildings which had been constructed prior to the 1934 seismic structural code revisions. This event once again focussed attention on the hazardous nature of the old unreinforced masonry structures.

More seismically related legislation was passed in California during the two years following the Sylmar-San Fernando Valley earthquake than was adopted either before the quake or since then. Among the legislation enacted was a City of Long Beach ordinance entitled "Earthquake Hazard Regulations for Rehabilitation of Existing Structures Within the City," passed on June 29, 1971. Despite the fact that it became known by engineers, architects, and public officials after 1933 that existing unreinforced masonry buildings posed a significant hazard to occupants during seismic events, it took until 1971 for Long Beach to pass an ordinance to mitigate those hazards, and Los Angeles did not enact a similar ordinance until 1981, ten years after the Sylmar-San Fernando Valley earthquake and 48 years after the Long Beach quake. **The history of legislation, the evidence of coroner's inquests, and the observations of building industry specialists confirm the hazardous nature of unreinforced masonry buildings.**

CHAPTER 5

THE ENGINEERING PROBLEM AND ALTERNATIVE SOLUTIONS

Revisions to the Final EIR in Response to Comments on the Draft

Very few comments on the Draft EIR were received which were critical of the information in this chapter. Other than minor revisions and editorial changes, no significant additions or corrections were made in this chapter. The descriptions of the three primary strengthening programs considered in the EIR were revised and simplified. Questions about the basic objectives of an ordinance (life safety or building damage reduction) were reconsidered in section 5.3

There are a wide variety of alternative methods available for strengthening unreinforced masonry structures. Engineers studying this problem and designing strengthening programs differ regarding how best to achieve effective life safety and building damage reduction. However, in contrast with the lack of agreement about effective solutions, there is near unanimity of opinion about how and why unreinforced structures fail in a moderate to strong quake. Therefore, before discussing alternative solutions to the strengthening problem, a brief review of unreinforced masonry building deficiencies and failure characteristics is provided. Chapter 7 of the EIR expands on this summary of characteristic building failures by providing information about the performance of unreinforced masonry buildings in the Loma Prieta quake.

5.1 Building Failure Patterns

The specific ways in which unreinforced masonry buildings are typically deficient in earthquake resistance are reviewed and partially illustrated in the following discussion. The major deficiencies of unreinforced masonry buildings, simplified into categories that are related to corresponding strengthening measures discussed in Section 5.2 of this chapter include:

1. Parapet Failure
2. Non-parapet Falling Hazards
3. Wall-Diaphragm Tie Failure
4. Wall Failure in Bending Between Diaphragms
5. Excessive Diaphragm Deflection
6. Corner Damage
7. In-plane Wall Failure
8. Roof and/or Floor Collapse
9. Soft Story or Other Configuration-induced Failure.

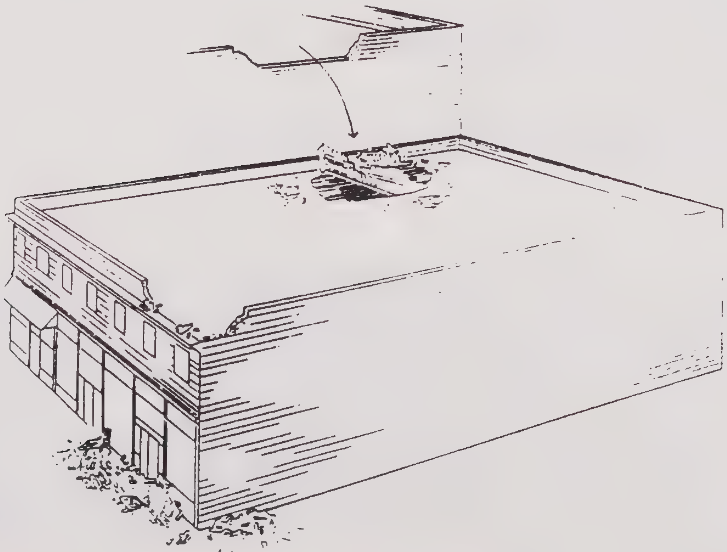
The EIR glossary contains definitions of important technical terms. The illustrations in the following figures provide non-technical illustrations of important types of building failure.

<u>Parapet Failure</u>

Figure 5-1 illustrates the failure mechanism of a dislodged and falling parapet. Parapets can fall either onto the ground along a street or sidewalk or on lower, adjacent buildings. This figure illustrates an instance of parapet failure which is quite representative of many such failures in earthquakes. **Parapet failure is one of the leading sources of earthquake fatalities**; these failures can either be direct (where the parapet falls directly on the street) or indirect (where the parapet falls on an adjacent building which subsequently experiences collapse). Since parapets function as cantilevers, their bending stresses are typically greater than stresses on the walls spanning diaphragms because they have no redundant means of support. **Parapets are typically the weakest link in an unreinforced masonry building, failing at only moderate levels of shaking.** The presence of roof flashing inserted between brick courses at the base of a parapet can further increase the parapet's vulnerability.

FIGURE 5-1
Parapet Failure

Parapet Failure in Watsonville, Loma Prieta Earthquake



Schematic Drawing

Non-Parapet Falling Hazards

There are two different types of non-parapet falling hazards: pounding with adjacent structures can loosen brick and facing material and in other instances the outer wythe (layer) of brick can collapse away from a structure.

Damage to or loss of cornices are another common type of characteristic non-parapet building surface failure; depending upon the architectural character of the building, there may be brick, terra cotta, or stone friezes, pediments, lintels, brackets, statuary, finials, on the building facing that can be dislodged as a result of shaking. These other appendages should be treated separately from parapets because their retrofit processes are different and because almost all unreinforced masonry buildings were constructed with parapets while only the more architecturally elaborate buildings present other types of appendage hazards.

A variety of means have been used in unreinforced masonry buildings to tie non-parapet appendages to walls but in many cases, metal ties which ultimately corrode and lack positive mechanical connection to such walls have been relied upon to prevent collapse. Where veneer wythes of brickwork are present, they have rarely been bonded to the backing with header courses or tied with metal anchors. The most likely location for veneer is on the front or publicly exposed faces of a building, which is of course where there is generally the greatest risk exposure for pedestrians. **Non-parapet falling hazards are another significant risk factor for pedestrians during even a moderate quake.**

Wall-Diaphragm Tie Failure

Figure 5-2 illustrates a typical wall-diaphragm tie failure. **Wall-diaphragm ties are actually relatively common in unreinforced buildings, but unfortunately the specific details used in these ties typically create low-strength connections.** Tension-only bars, such as the government anchor (with one end of a steel bar embedded one wythe in from the outside face and the other forming a spike hooked end hammered into the side of a joist) is the frequently used tie method in unreinforced buildings. These ties are placed where the joist bears on the wall. Where the joists run parallel to the wall, ties are seldom present. Once a wall-diaphragm tie fails, the wall is free to deflect outwardly.

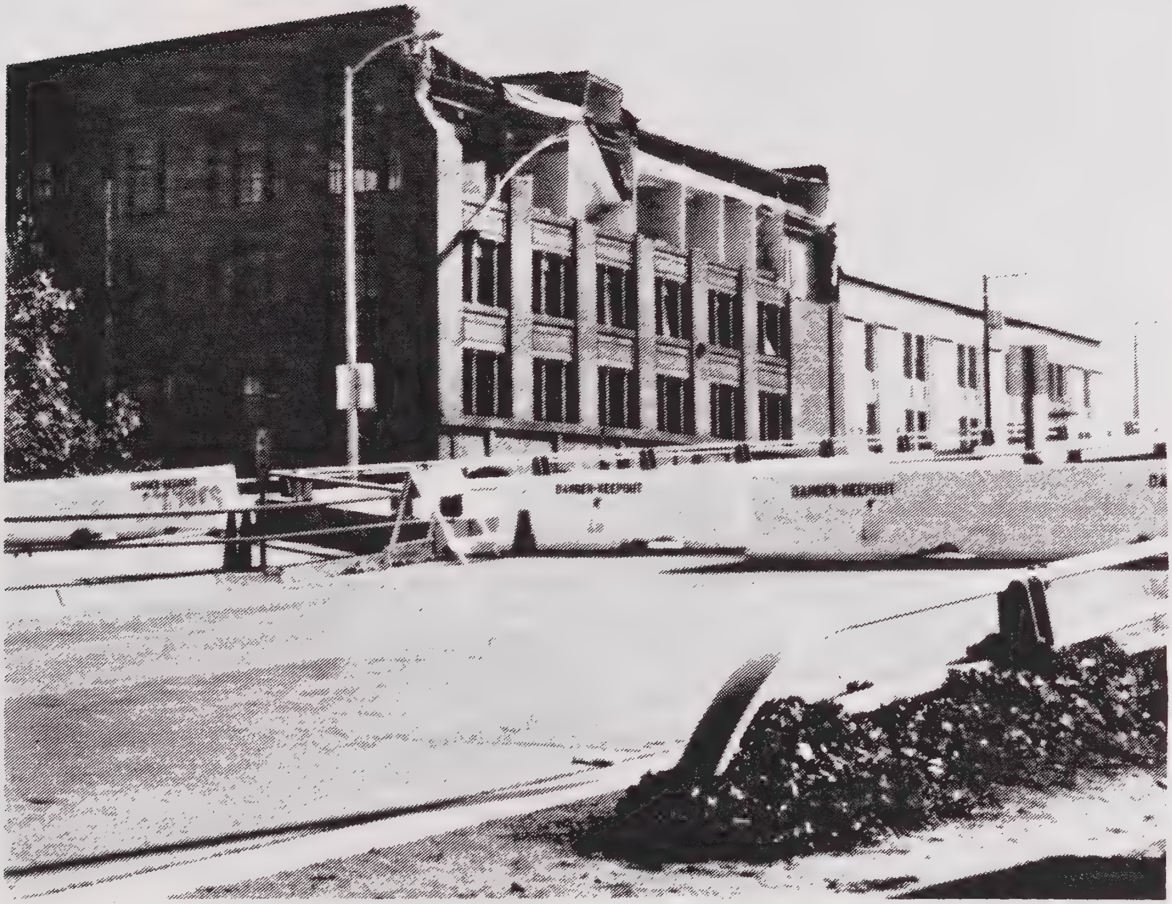
Wall Failure in Bending Between Diaphragms

Figure 5-3 illustrates this type of deficiency, for which the presence of strong wall-diaphragm ties is a prerequisite condition. Without these ties, the wall-diaphragm tie failure would be the weaker structural element and consequently a failing wall would fall outward in larger pieces and not necessarily between floors. If strong wall-diaphragm connections exist, and if the ground motion is sufficiently severe, the failure sequence then moves to the vertical midspan of the wall, rather than at a story level as with the wall-diaphragm tie failure. Unreinforced masonry walls acting as vertically-spanning simply-supported (or continuous if more than one story or with parapet) beams are ill-suited for this role because the material is inherently lacking in tensile resistance. **As the outer bricks flex (assuming the wall is thrown outward), the small tensile capacity of the mortar is exceeded, a horizontal crack forms, and if the wall does not rock back in the other direction before reaching a point of instability, collapse results.** This failure mode has been somewhat uncommon in past earthquakes, but may prove to be the next weak link if floor-wall ties are the only means of strengthening a building.

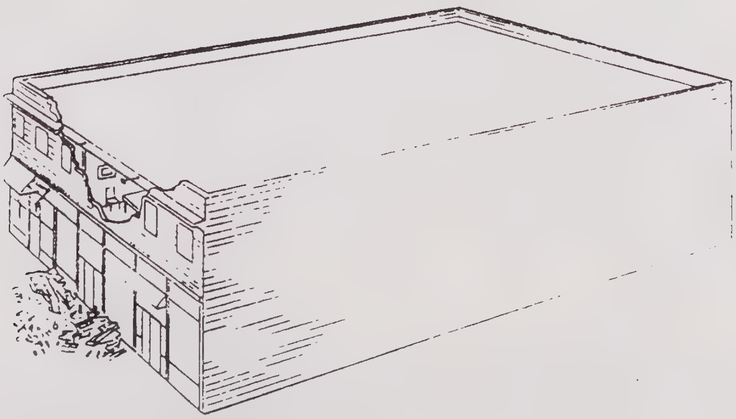
Excessive Diaphragm Deflection

Figure 5-4 displays an excessive diaphragm deflection failure which, from an analytical standpoint, is explained in terms of the same body of beam theory used to analyze beams that carry vertical gravity loads. Where full-height partitions or interior bearing walls are not present, diaphragms span one end o the building to the other, and thus the overall plan configuration is a good indicator of vulnerability to the excessive diaphragm deflection problem.

FIGURE 5-2
Wall-Diaphragm Tie Failure

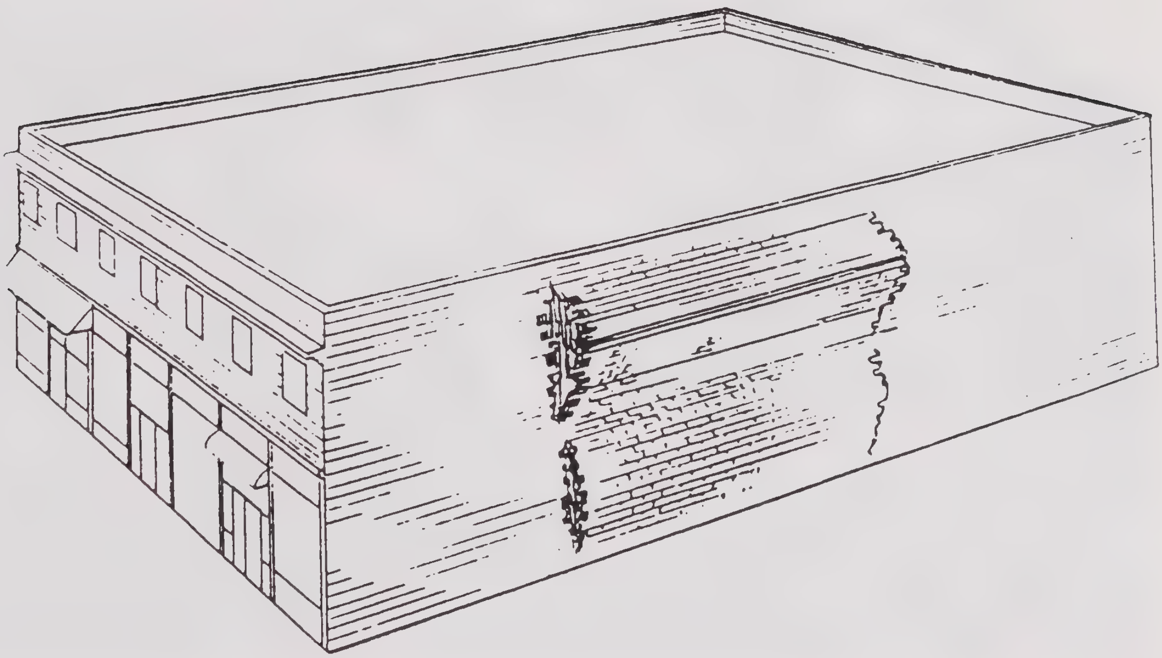


Marina District Unreinforced Building in San Francisco, Loma Prieta Quake



Schematic Drawing

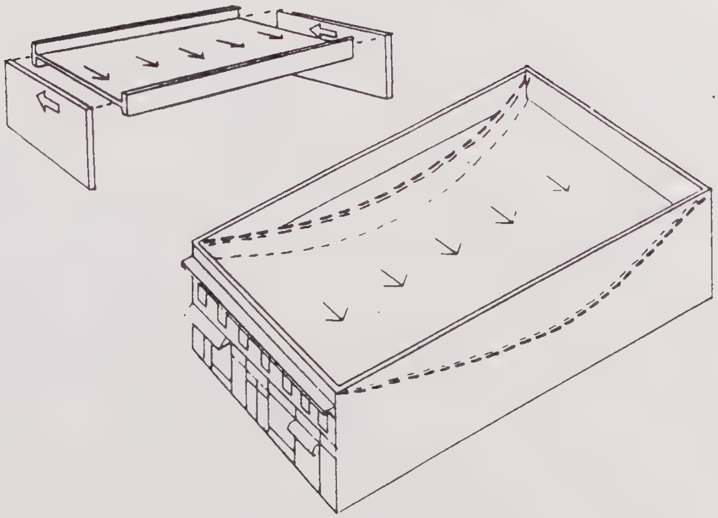
FIGURE 5-3
Wall Failure in Bonding Between Diaphragms



Schematic

FIGURE 5-4
Excessive Diaphragm Deflection

Buildings in the Pacific Mall, Santa Cruz, Loma Prieta Quake
(note second story failures)



Schematic

Long, narrow building plan layouts (or a high ratio of length to width) which are common in the Ventura building inventory, increase vulnerability to this hazard. Excessive diaphragm deflection which would occur near the middle of the structure can contribute to the out-of-plane failure of masonry walls.

Corner Damage

Damage to the corners of unreinforced buildings has been observed in previous earthquakes. This failure mechanism is generally understood to result from a lack of shear anchorage between the roof or floor diaphragm and the reinforced masonry walls, which allows the diaphragm to slip relative to the longitudinal wall, ultimately punching out the wall oriented transversely to the diaphragm motion. This type of failure may be exacerbated by corner discontinuities and the inability of the longitudinal walls to carry the tensile forces generated when the transverse walls deflect outward and span not only vertically to the diaphragms but also horizontally to the longitudinal walls. **Figure 5-5** illustrates a typical failure of this type.

In-Plane Wall Failure

This type of failure results in classic "X-cracking" in-plane damage. Similar to the other deficiencies and failures discussed above, various sequences and combinations of damage are possible in the event of an in-plane wall failure. When this type of deficiency occurs, "X-cracking" around openings can isolate trapezoidal-shaped fragments of masonry which are then especially prone to out-of-plane failure. Any in-plane cracking along walls contributes to out-of-plane falling hazards. If a diaphragm spans several walls, in-plane overstress and cracking can cause one or more of these intermediate points of support to become ineffective, causing the diaphragm problem described above. Typically, stocky piers (low height-width ratio) in a structure are more likely to fail in shear while more slender piers (with respect to height-width ratio) may experience rotations and horizontal cracking. **If out-of-plane failure does not result, and the in-plane loading continues, a failure in sideways or other loss of vertical load-carrying ability may result ultimately causing collapse depending on an earthquake duration or intensity.**

In-plane failure is not as frequent in the typical hierarchy of the fragility of the walls as the previously described mechanisms because effective shear transfer to the wall is required, or often the wall fails out-of-plane before this occurs. It is also true that a wall can tolerate a greater amount of in-plane damage, such as X-cracking, without collapsing, than with out-of-plane damage. Especially with thick walls, severe cracking or even falling out of localized pieces of masonry can occur without collapse.

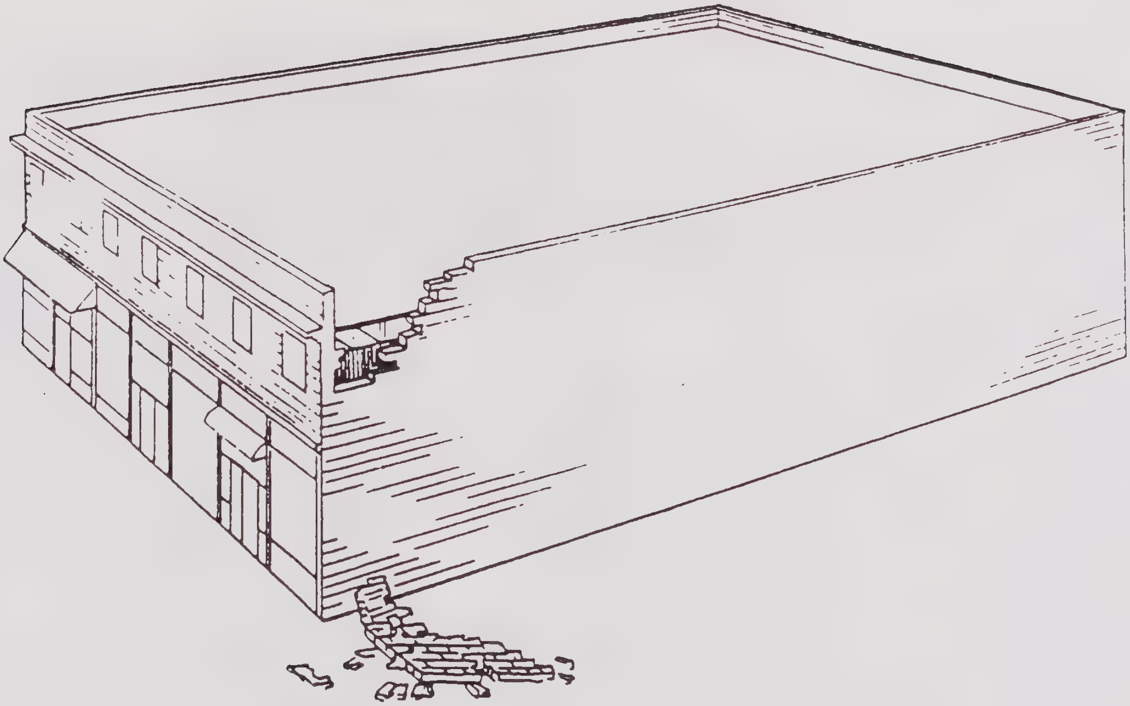
Roof and/or Floor Collapse

This type of failure (Figure 5-6) may be the final mode of destruction brought on by one or more of the other failures discussed above. Redundancy in the construction of an unreinforced building or the presence of back-up components which may provide support (even if not designed for that structural role), are often the means by which unreinforced masonry buildings avoid collapse even though large portions of bearing walls fail. Collapse of part of a second-story bearing wall can cause collapse of a related portion of the roof, and this impact, or a separate failure of the ground-story bearing wall, can cause the second floor to fall. **Partitions can provide back-up load paths to hold up floors and roofs after bearing walls have partially collapsed, so the usual type of unreinforced masonry building most vulnerable to this type of failure is an occupancy such as theater, or single-span store which are typical of buildings along Main Street.** The opposite end of this vulnerability spectrum is the apartment building with cellular partitioning of all stories which inhibits roof and floor collapse.

Soft Story or other Configuration-induced failure

Building configurations that cause severe irregularities in the distribution of strength and stiffness can cause damage with any type of construction, including unreinforced masonry.

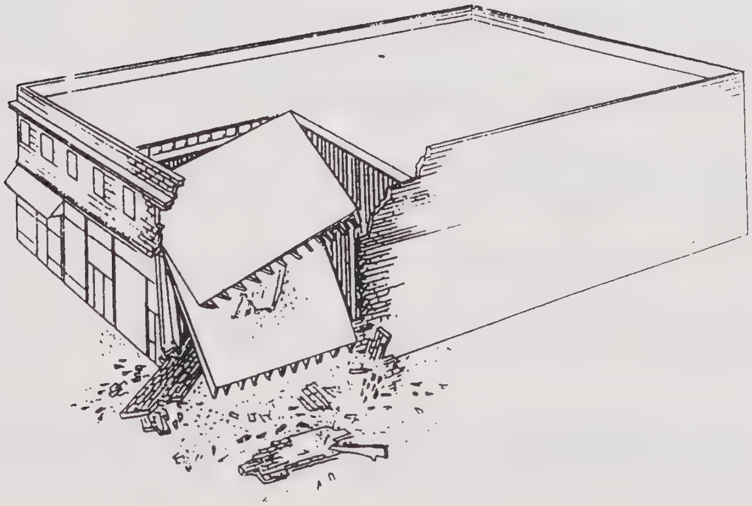
FIGURE 5-5
Corner Damage



Schematic

FIGURE 5-6
Roof and Floor Collapse

Damaged Buildings on State Street, Santa Barbara, Santa Barbara Earthquake of 1925



Schematic

The soft story, perhaps the most common configuration problem, occurs where a level has much less strength and/or stiffness (typically the ground story where spaces are often less subdivided with walls or columns) than other stories. **An unreinforced masonry building that originally had ample solid bearing/shear walls at ground level may have been remodelled over time to increase storefront window area, or it may originally have had a soft-story design.** Reentrant corners in complex plans can also concentrate loads in one area of a building rather than allowing for more even load distribution. Torsion (twisting of the building when viewed in plan) can also be caused by complex plan configurations. **Figure 5-7** illustrates a schematic soft-story type of failure in an unreinforced masonry structure.

There are other types of building deficiencies typical of unreinforced structures that have been summarized and evaluated in the existing literature. These types of failure, summarized below, not only generally confirm the typology of building failure types outlined in the preceding discussion, but also elaborate on other potential failure mechanisms.

The Applied Technology Council study of unreinforced masonry building failures, Evaluating the Seismic Resistance of Existing Buildings (ATC, 1987), includes a comprehensive literature search of earthquake damage examples for various types of construction, including unreinforced masonry buildings. Nine specific types of poor performance are listed as characteristic of unreinforced masonry construction:

1. Falling parapets or cornices;

2. Inadequate wall-diaphragm anchorage, especially gable end walls; if bearing walls are uninvolved, floor collapse can occur;

3. Unbonded or inadequately tied exterior veneer courses;

4. Inadequate beam-pilaster connections causing beams to fall;

5. In-plane shear overstress, especially where wall-diaphragm anchorage failure, a masonry unit joist; walls generally remain stable and continue to support floors;

6. Overstress of steel lintels spanning across storefronts, or inadequate end connections;

7. Slender (excessive height-thickness ratio) walls failing under out-of-plane loads;

8. Substantial plan irregularity and resulting torsional effects or incompatible distortions at reentrant corners, such as with cruciform or T-, L-, or U-shaped plans;

9. Abrupt changes in lateral resistance from one level to another, such as soft stories.

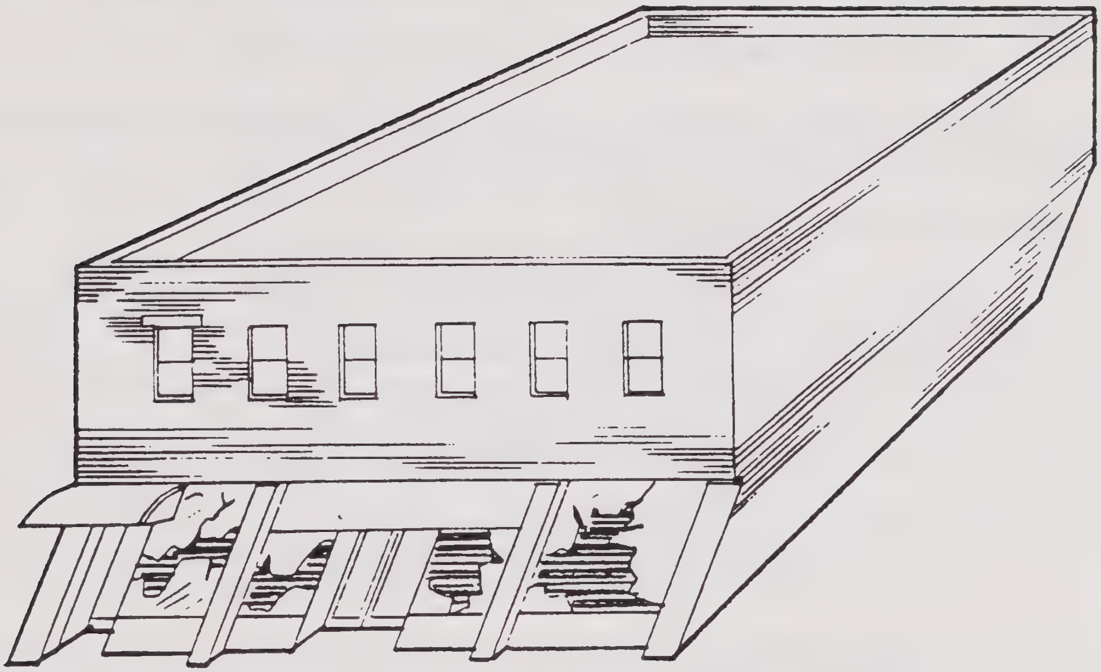
Kariotis and Ewing (1979) listed seven basic failure modes inferred from observations of damaged buildings:

1. Wall collapse caused by (a) inadequate wall-diaphragm anchorage (most commonly), (b) out-of-plane bending, (c) in-plane shear or flexural failure, or (d) excessive diaphragm deflection;

2. Diaphragm failures in (a) shear, (b) shear connection to wall or other vertical resisting element, (c) horizontal-shear connection chord failure, or (d) chord failure;

3. Excessive deflection of diaphragm (causing failure of partitions laterally supported by diaphragm, as distinct from the failure mode of number 1(d) above involving masonry walls);

FIGURE 5-7
Soft Story Collapse



Schematic

4. Parapet, cornice, veneer, or other appendage failure;

5. Differing dynamic response of components of complex buildings;

6. Pre-earthquake distress (foundation settlement, deterioration, or previous earthquake damage);

7. Effect of infilled unreinforced masonry walls on frames.

Damage to unreinforced masonry buildings in the 1983 Coalinga, California earthquake was evaluated (Rietherman et al., 1984), producing the following lists of failure mechanisms:

<u>Walls Subjected to Out-of-plane Forces</u>

1. Lack of any joist anchor (sometimes pertaining to walls parallel to roof framing while other walls in the same building had anchors);

2. Failure of masonry-joist anchor connection (the most common type of anchor failure);

3. Joist anchor metal failure (brittle metal); (observed, but not commonly);

4. Joist anchor shear failure at anchor-wood joist connection (listed but not noted in the Coalinga earthquake; test data referenced predicts failure at joist only when mortar is rich in cement and anchor is embedded in thick brickwork);

5. Masonry wall failure in flexure, anchor did not fail (difficult to verify from observation of wall debris);

6. Parapet wall failure in flexure;

<u>Walls Subjected to In-plane Forces</u>

7. In-plane shear overstress, perhaps contributing to subsequent out-of-plane failure;

<u>Diaphragm Behavior</u>

8. Excessive diaphragm distortion;

9. Lack of shear transfer from diaphragm to walls providing lateral support, such as infrequent joist anchors without blocking on walls parallel to framing, allowing diaphragm to slide past end wall and punch out corner;

10. Rotation of diaphragm ends (behaving somewhat as a fixed-end rather than purely simply-spanning beam).

5.2 Alternative Strengthening Activities: Engineering Solutions

There are, in theory, a relatively large number of methods available for stabilizing and strengthening unreinforced masonry structures. These solutions differ from one another in critical ways including:

- degree of visibility after the completion of renovation work;
- extent of disturbance to building occupants during renovation;
- types of deficiencies to be remedied;
- choice of construction materials, methods, and approaches; and
- degree of strengthening and life safety hazard reduction desired.

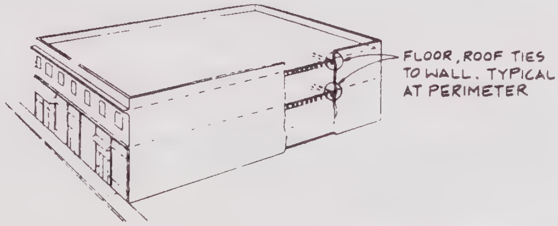
To provide an understanding of how typical building failures are prevented and to put into perspective the options studied thus far by the City, **a complete range of possible upgrade activities are presented in the following summary.** As in the prior discussion, the illustrations provided of each strengthening activity provide nontechnical descriptions of upgrade design and technology. Common strengthening activities employed in retrofitting to mitigate the structural deficiencies discussed above are described in this section. The illustrations are not intended to be complete structural design detail drawings. The spacing of bolts or braces, for example, is representative but may vary significantly from one case to another based on project-specific engineering design and analysis. **The potential disruption to occupants associated with each activity is also summarized in the following discussion.**

The following summary of activities is designed to familiarize the EIR reader with the range of possible technical solutions available to strengthen buildings. How these activities have been organized into the various levels of alternative upgrade programs is discussed in the following section (4.3). **A review of the following conventionally accepted strengthening activities is provided in part to demonstrate that in pursuing a Level I or II upgrade, the City has limited the range of possible upgrade construction activities to a relatively small range of methods, most of which are minimally disruptive. This discussion is relatively technical and the general reader may turn to Section 4.3 to learn which of these activities would be required for the four levels of upgrading discussed in the EIR.**

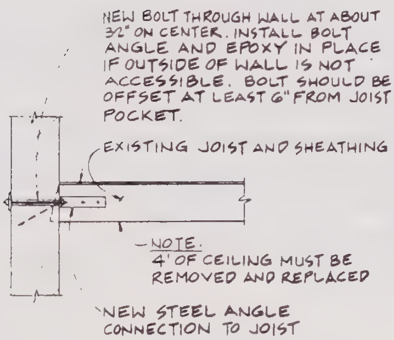
Strengthening Activity 1: Tension Anchors

The most basic strengthening activity for retrofitting unreinforced masonry buildings is the addition of tension anchors to connect the roof and floor diaphragms to the walls. By tying the walls and diaphragms together, out-of-plane wall deflections are limited by the diaphragm, and certain failures can be minimized. Several techniques are available for installing anchors depending on access and joist framing conditions. When the joists are exposed from below and easily accessible, the work can be done using Details la and lb below. Disruption to occupants will be minor, and only the exterior plate will be visible. When a finished ceiling is present, it must be removed in order to use Details la and lb. Alternately, ties can be installed from the top of each floor, as indicated in Details 1c and 1d. Disruption may be more extensive since some existing sheathing may be removed temporarily and some finish work may be needed. However, the ceiling below the joists is not disturbed in this approach. Construction may also be necessary at the ceiling-to-wall connection when strengthening to a **Level III** standard.

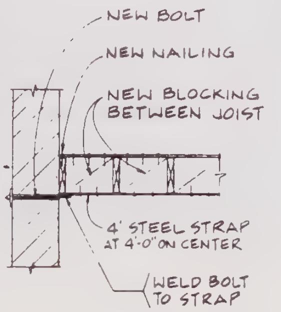
The actual construction details used will depend on existing conditions, as well as on whether or not shear anchors (a chord and plywood sheathing) are also installed. Building retrofits in Los Angeles indicate that this type of perimeter work can usually be accomplished with continued occupancy while anchors are being installed.



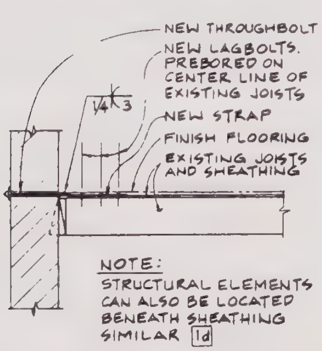
LOCATION IN BUILDING



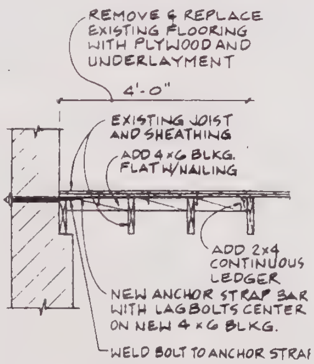
1a JOISTS PERPENDICULAR TO WALL
(ACCESS FROM BELOW)



1b JOISTS PARALLEL TO WALL
(ACCESS FROM BELOW)



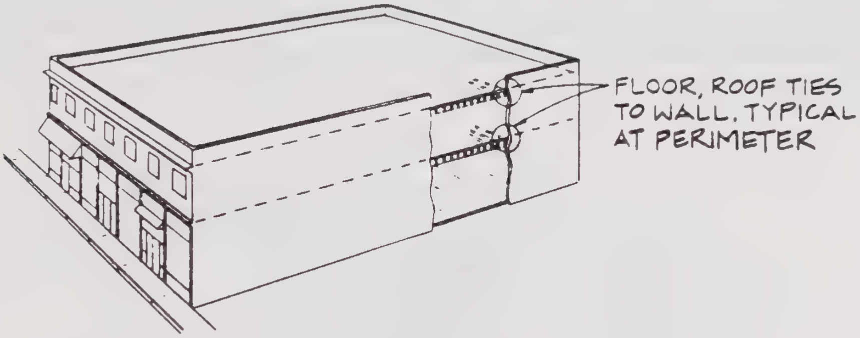
1c JOISTS PERPENDICULAR TO WALL
(ACCESS FROM TOP OF FLOOR)



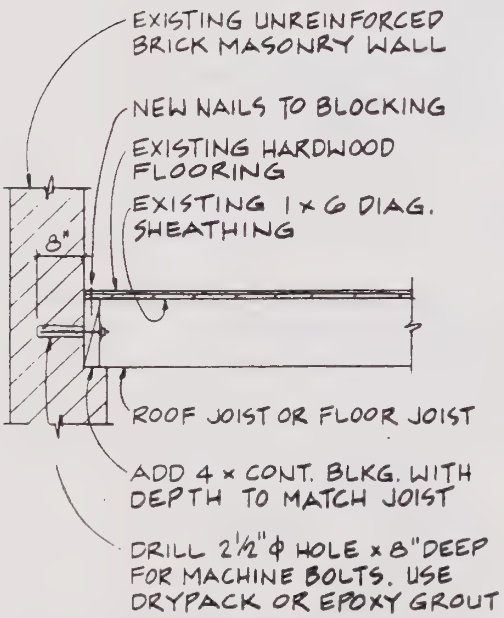
1d JOISTS PARALLEL TO WALL
(ACCESS FROM TOP OF FLOOR)

Strengthening Activity 2: Shear Anchors

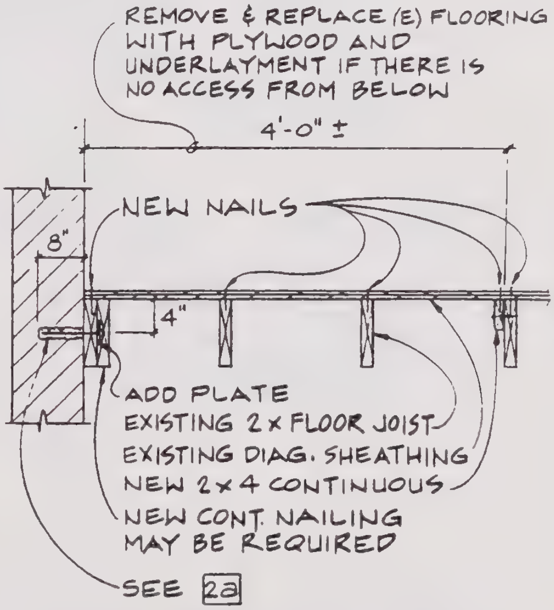
Shear anchors are designed to transfer forces from the roof and floor diaphragm to the shear walls. Just as tension anchors help to prevent the diaphragm from separating from the wall, shear anchors help to keep the diaphragm from sliding along the wall. To install new shear anchors access from either the top or the bottom of the diaphragm is required. The damage to existing finishes will be similar to that incurred by adding tension anchors. Two possible details for shear anchors (depending on the joist framing conditions) are provided below.



LOCATION IN BUILDING



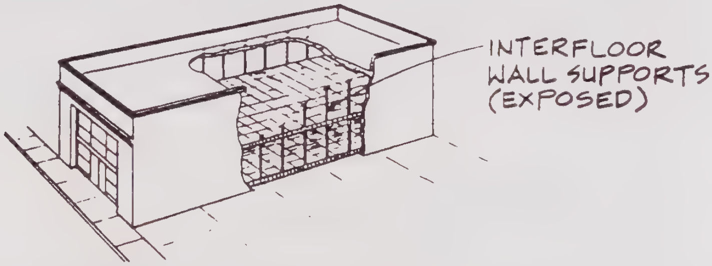
2a JOISTS PERPENDICULAR TO WALL



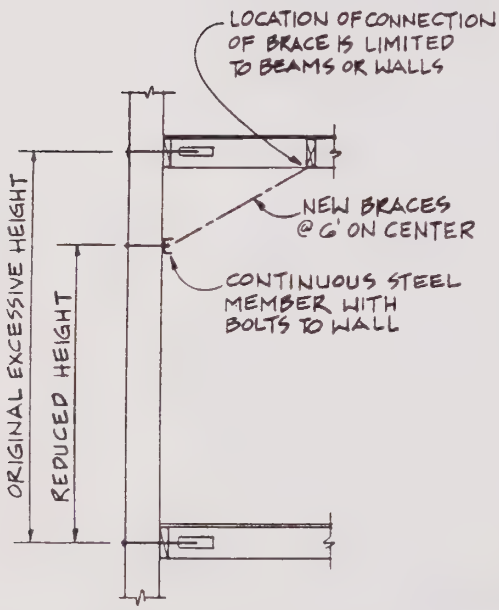
2b JOISTS PARALLEL TO WALL

Strengthening Activity 3: Interfloor Wall Support (Visually Exposed)

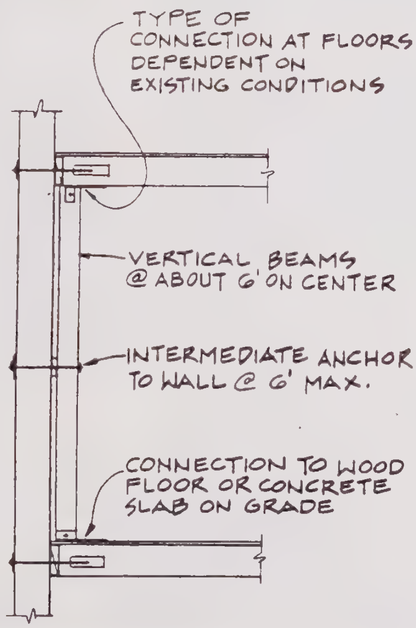
Unreinforced masonry walls with larger height-to-thickness (h/t) ratios are more likely to buckle out-of-plane under lateral loading. **Interfloor wall supports, often made of steel members, are added to walls with unacceptable h/t ratios.** The added supports, shown below, are exposed to view and will thus have an impact on the aesthetic or historic qualities of interior spaces. **These types of support are often used in industrial buildings and garages.** In Detail 3a, a diagonal brace connects the floor to the wall and reduces the effective height of the wall. Such supports require a stiff floor structure to adequately resist seismic loads carried by the brace. In Detail 3b, a vertical element spans between floors and braces the wall near the midpoint with anchors. Either bracing system could be covered with gypsum board (at additional costs) to eliminate the visibility of this work.



LOCATION IN BUILDING



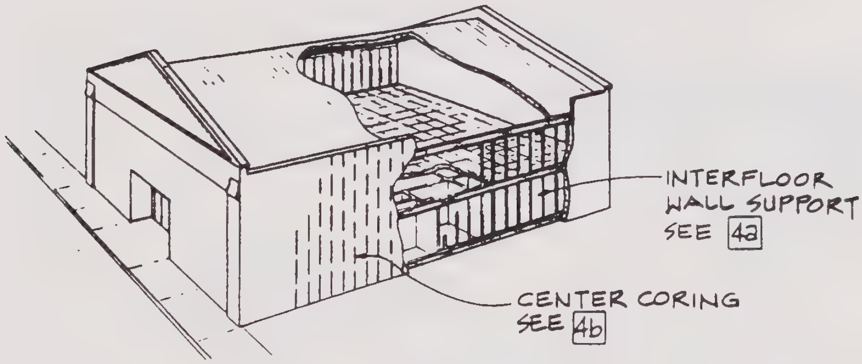
3a DIAGONAL BRACE



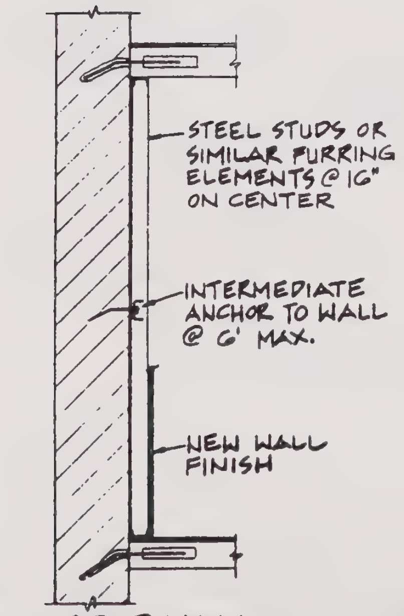
3b VERTICAL BRACE

Strengthening Activity 4: Interfloor Wall Support (Visually Hidden)

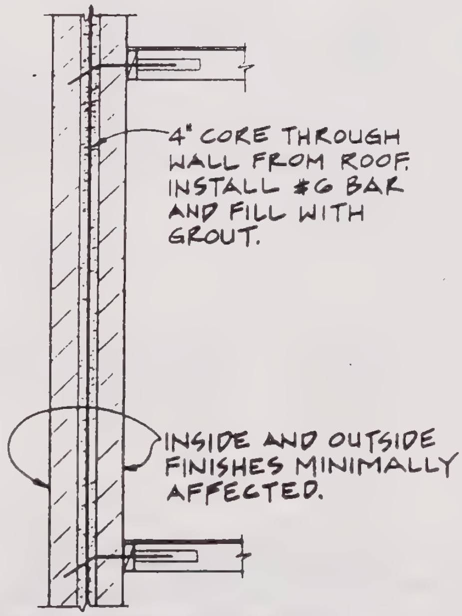
The interfloor wall supports described in Activity 3 are visually exposed. If this is unacceptable for any reason, other, more expensive, approaches can be employed. The visually hidden approaches are usually employed in historic structures where the visual integrity of the building is important. Detail 4a shows a steel stud wall that has been added adjacent to the masonry. Each stud can be used as a wall support, or such a wall can be used as furring to conceal strongbacks. Although a finished surface is obtained, interior space is lost and special details must be employed at door or window penetrations in the thickened wall. In Detail 4b another approach is illustrated. A core is drilled from the roof down the inside of the unreinforced masonry wall. A steel reinforcing bar and polyester grout are placed in the hole to increase the wall's tensile capacity and resistance to buckling. While there is drilling noise associated with this center coring process, both outside and inside finishes of the wall are only minimally affected, and the wall thickness is not altered.



LOCATION IN BUILDING



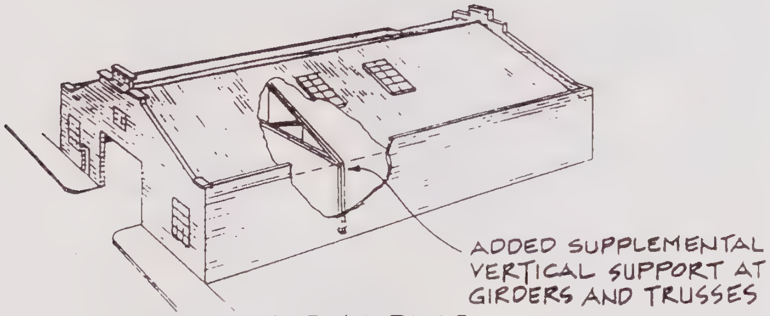
4a STUD WALL



4b CENTER CORING

Strengthening Activity 5: Supplemental Vertical Supports

The walls in an unreinforced building generally can either bear all or most of the vertical load. When the walls fail during lateral loading, the girders and trusses that they support may also fail, initiating a collapse or partial collapse of the roof and floors and greatly increasing the risk to life safety. **Protection against floor and roof collapse can be obtained by adding supplemental vertical supports, buttresses, girders and other horizontal load-carrying members.** The vertical supports are usually made of steel and may be wide flange "I" sections or tube members. They can be left exposed or, at greater expense, they can be covered with facing. To carry the vertical load from the roof and floors into the ground, new foundations are required when the existing foundation cannot be utilized. The addition of a new foundation requires pouring concrete inside the building, which, primarily because it is a "wet" process, is locally far more disruptive than work with wood or steel.



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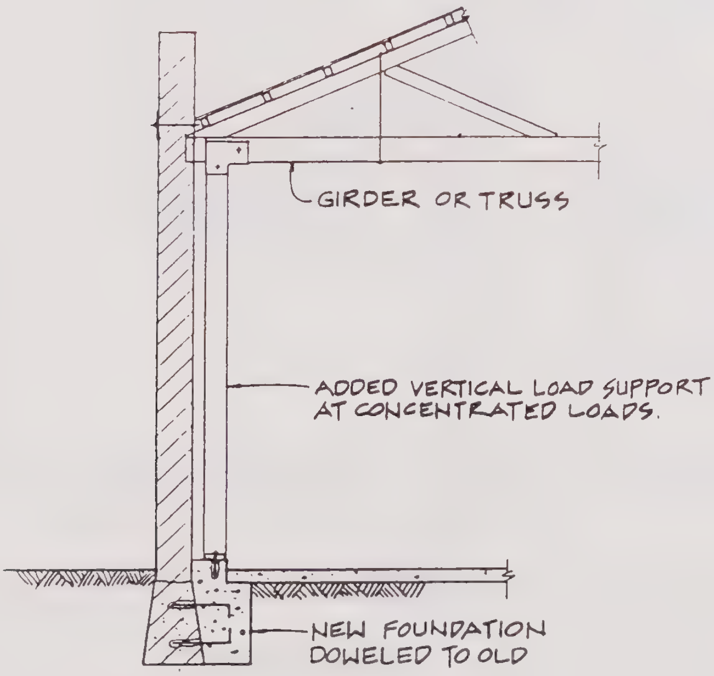
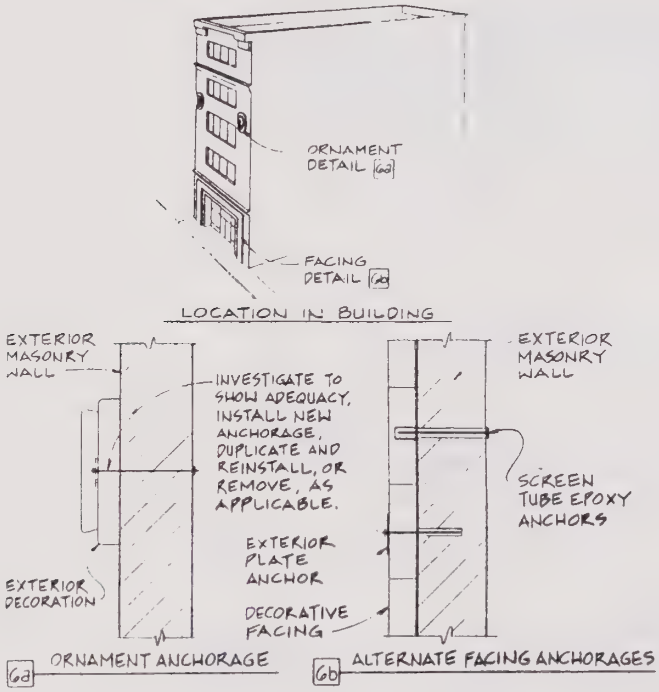


5 SECTION

Strengthening Activity 6: Anchor Parapets and Non-Parapet Falling Hazards

Non-structural parapets and architectural ornamentation and facing elements that are poorly anchored can pose a serious falling hazard to pedestrians and property below. The types of ornamentation and facing found on unreinforced masonry buildings vary widely and generic strengthening details are impossible to develop. It may be necessary to remove ornamentation or otherwise expose its support temporarily to determine whether existing anchorage is adequate and/or to add strengthened anchorage systems. Usually, the disruption to the interior is minimal. **To strengthen parapets and facing, the simplest technique involves working from the outside of the building and installing anchors with exterior washer plates or frames to secure parapets. To avoid visible plate anchors, details can be developed using countersunk plates and/or epoxy systems that avoid visible plate anchors, but these methods are usually more expensive.**



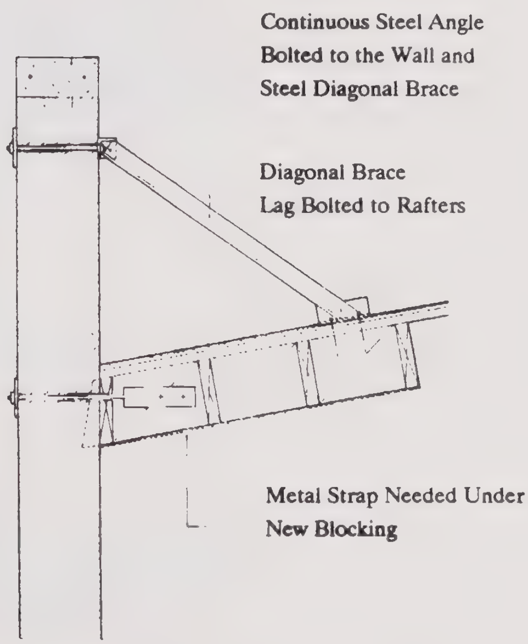
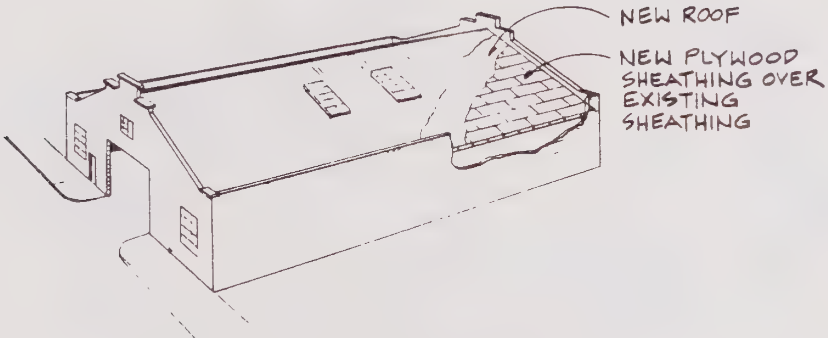


Diagram of Parapet Strengthening

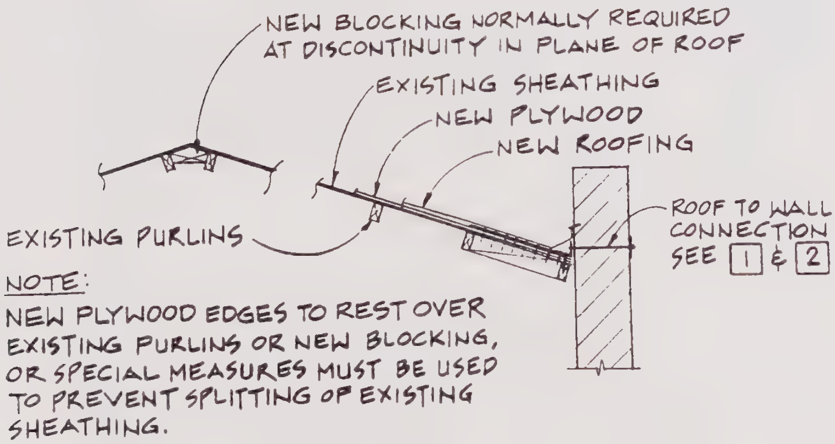
There are a variety of methods available for anchoring parapets. Securing a parapet is one of the most cost effective injury and death reduction improvement than can be implemented on most buildings. Collapsing parapets can be avoided by implementing a bracing program such as the one illustrated above. **Such programs are visually unintrusive and can actually improve the aesthetics of a structure if a proper, historically authentic anchor bolt design is employed.**

Strengthening Activity 7: Roof Sheathing with New Roof

The addition of new plywood sheathing increases the shear capacity of the roof diaphragm and reduces its midspan displacement during lateral loading. When it is difficult to apply plywood on the underside of roof framing or when the roof needs replacement for other reasons, new plywood sheathing can be added over the existing sheathing. Care must be taken to avoid splitting the existing sheathing edges when new nails are added. While there may be some noise during construction, the disruption to the interior is generally minimal since work is performed on the exterior of the building. When the new roof diaphragm is applied, new connections to the masonry walls must be made, or existing connections modified or strengthened. In some cases, a strip of new plywood around the perimeter of the building may be adequate.



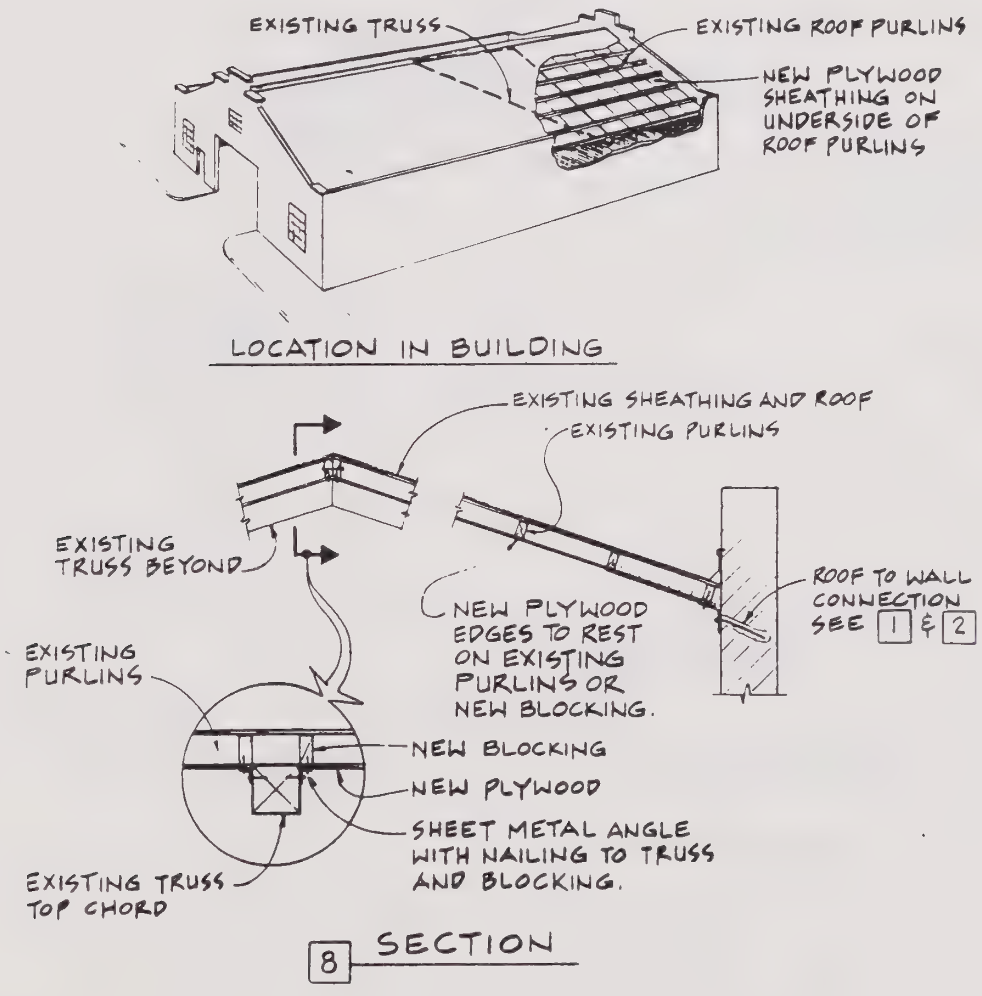
LOCATION IN BUILDING



7 SECTION

Strengthening Activity 8: Roof Sheathing Inside (Soffit or Ceiling)

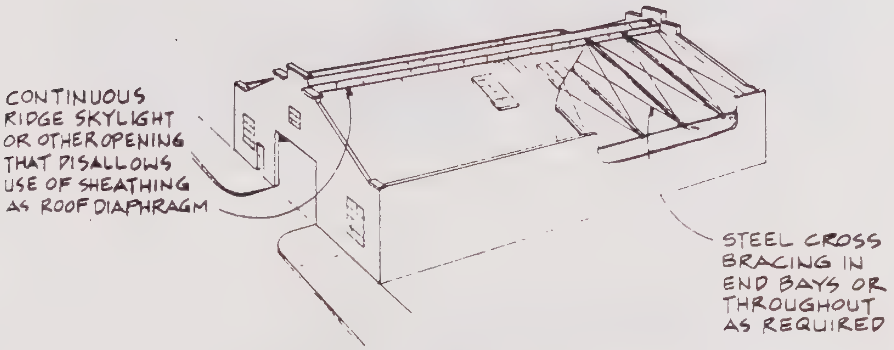
The addition of new plywood sheathing increases the shear capacity of the roof diaphragm and reduces its horizontal displacement during lateral loading. **When there is no ceiling below the roof and the bottom of the roof joists form a smooth plane, it may be easier and more cost effective to attach plywood to the inside face of the roof joists since it would then not be necessary to remove the existing roofing material.** Special details at truss chord locations and other discontinuities in the roof plane are required in such a system. Similar to the application of plywood on top of the roof, work will also probably be required at the roof-wall connection. Full occupancy of the top floor would be impossible during this activity, unless the work could be phased and thus confined to a portion of the area at a time.



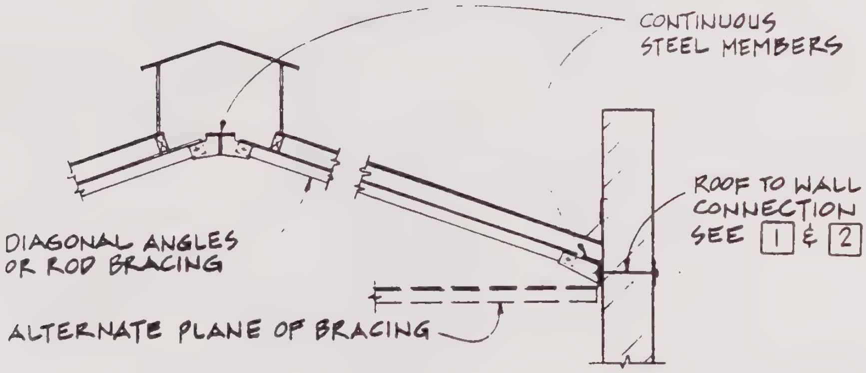
8 SECTION

Strengthening Activity 9: Roof Crossbracing or Other Special Solutions

The existing roof diaphragm on some buildings may have a continuous ridge skylight monitor, or other large discontinuity, which must be preserved. Such a discontinuous diaphragm often prevents the use of new plywood sheathing as a method of strengthening the roof to provide shear resistance and displacement control during lateral loading. **In such cases, steel cross braces can be used instead of plywood.** The cross braces can be placed in the plane of the existing roof or in a horizontal plane if the roof is pitched. Depending on the strength and configuration of the existing diaphragm, bracing may only be required in the end bays. The bracing can be left exposed or hidden behind a false ceiling. Regardless of the amount of bracing required, work on the roof-to wall connection is generally also required. The level of disruption will be similar to adding plywood sheathing on the inside of the roof.



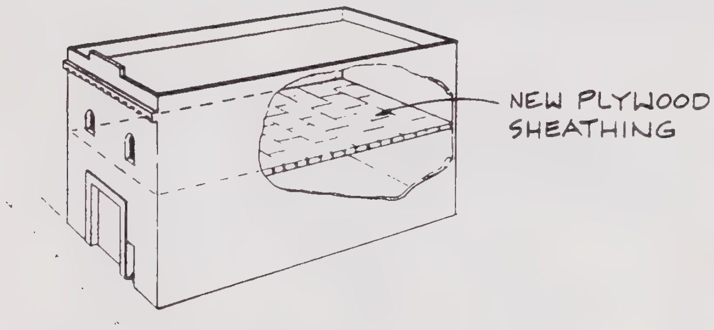
LOCATION IN BUILDING



9 SECTION

Strengthening Activity 10: Floor Sheathing--Open Area

Similar to strengthening methods for the roof, new plywood can be added to the floor diaphragms to increase their shear capacity and reduce horizontal deflections. Generally, the new plywood is placed on top of the existing plank or board sheathing. Since floor finishes must be removed to add the plywood to the building contents must be removed or moved around, and occupancy in the immediate area would be impossible. By working on one area at a time and moving occupants accordingly, the building need not be unoccupied during upgrade. Tension and shear anchors and chords are often added with the new sheathing.



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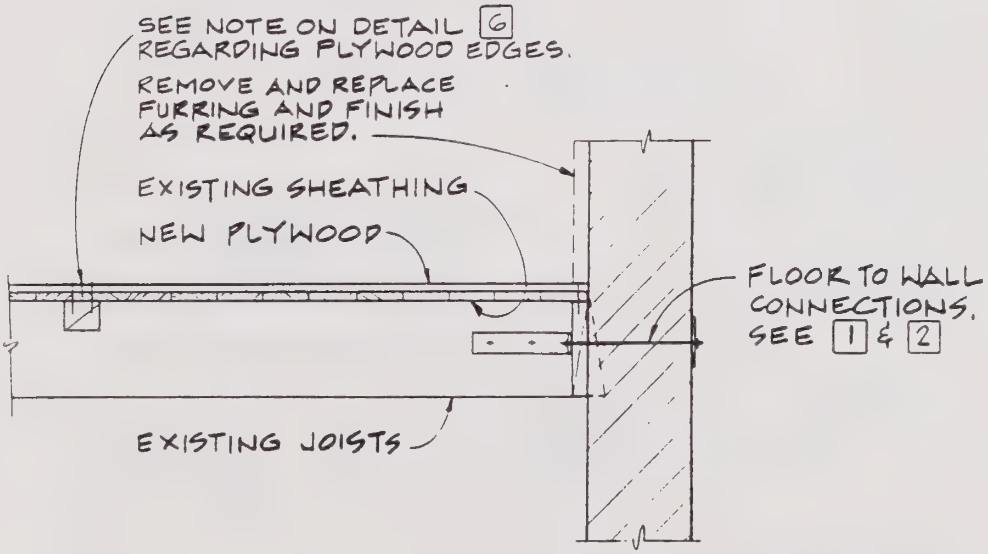
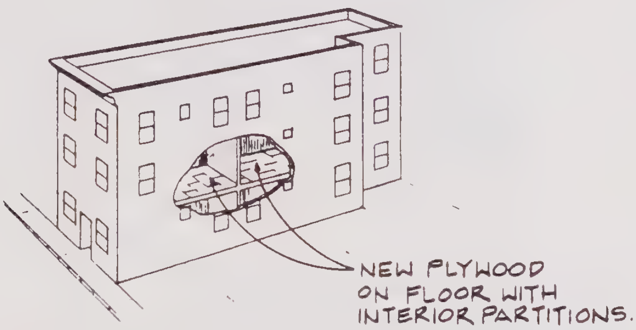


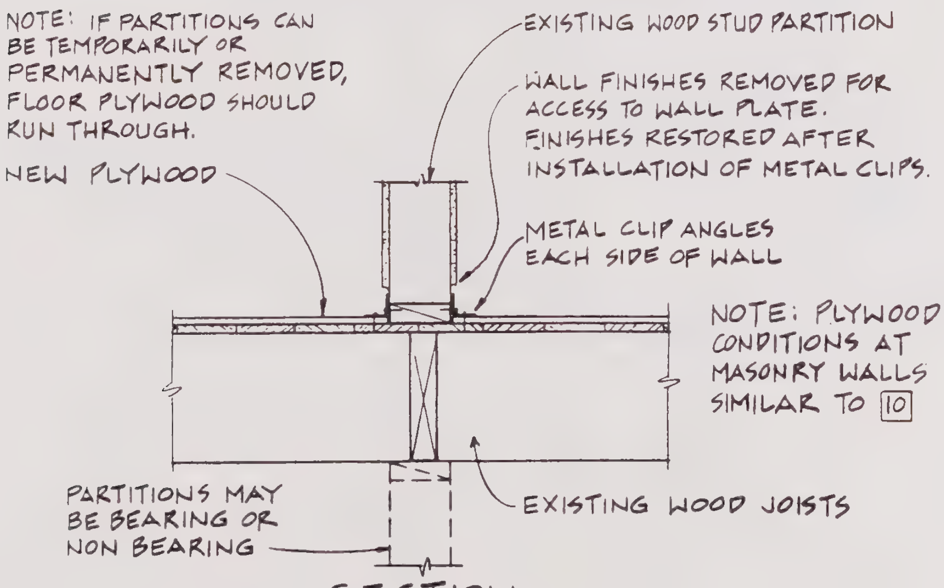
10 SECTION

Strengthening Activity 11: Floor Sheathing--Existing Partitions

For this strengthening activity, sheathing is added to floor diaphragms to increase their shear capacity and to reduce horizontal deflections. When partitions are present, a continuous path for the transfer of forces must be provided at each wall partition bottom plate. If the partitions can be removed, either temporarily or permanently, the approach described in Activity 10 can be used. If the partitions are not removed, new metal clips must be added at the base of the partition to allow for transfer of forces through the partition bottom plate. Finish material must be removed from the base of the partition to add the new metal clips. Although diaphragm shear forces can be transferred in this manner, the detail has never been tested. Due to questionable ability to transfer tension through the partition line, it is probably less effective than a continuous diaphragm. Similar to Activity 10, occupancy would be difficult during this activity, although the partitions form convenient phasing areas if the work is done on a room by room basis. Tension and shear anchors and chords are often added at the time new sheathing is installed.



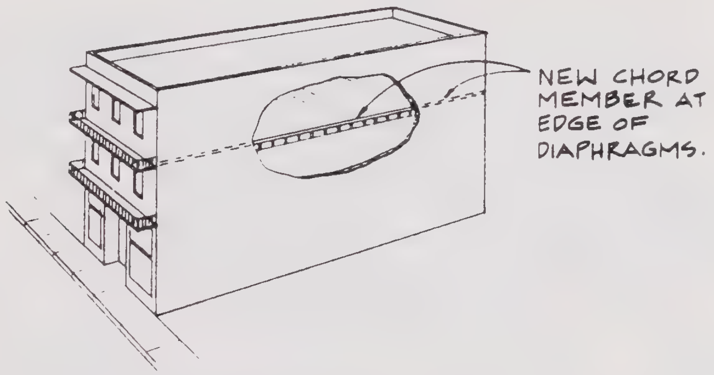
LOCATION IN BUILDING



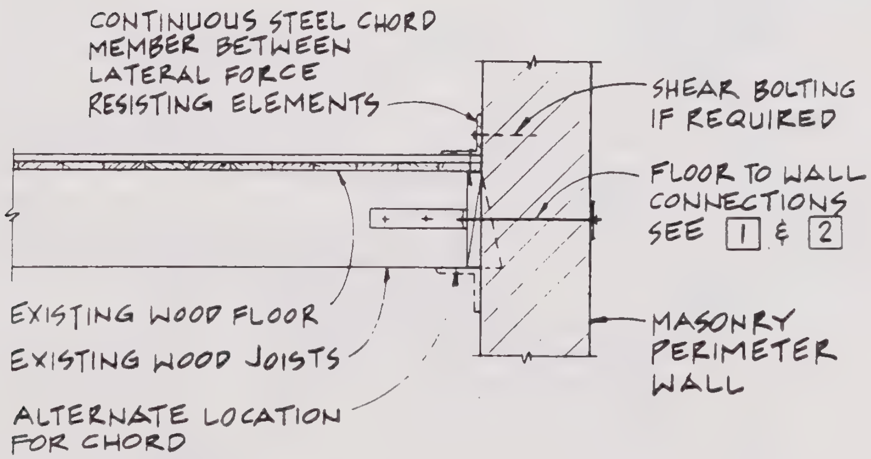
11 SECTION

Strenghthening Activity 12: Chords

Steel chord members are added to the edges of the floor and roof diaphragms to carry flexural forces, just as new plywood sheathing is added to carry shear forces. Perhaps more importantly, the chord element will also help to prevent vertical cracks in the masonry near corners or in spandrels by carrying horizontal tensile forces in the masonry wall. The chord is often a steel angle section that can be placed above or below the floor. It is also possible to develop a chord by interconnecting existing wood elements to form a continuous tension member along the wall, but the axial movement of such a system will probably not prevent vertical cracking of the masonry. If used as a diaphragm chord, it is essential to connect the member to the diaphragm so some finishes will need to be removed and patched. The chord may be installed as part of the tension and shear anchorage systems (see Activity 23).



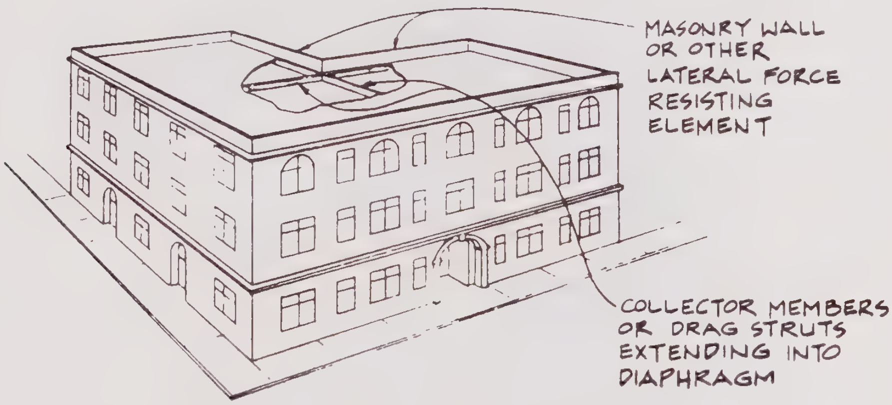
LOCATION IN BUILDING



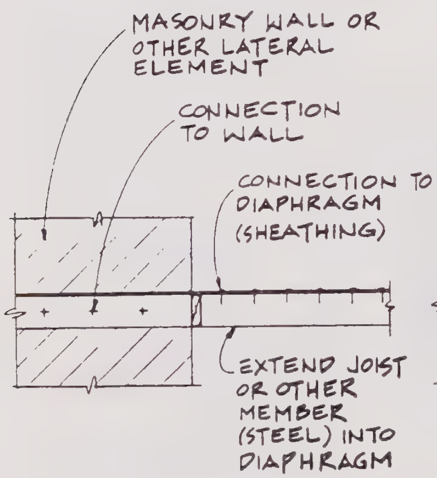
12 SECTION

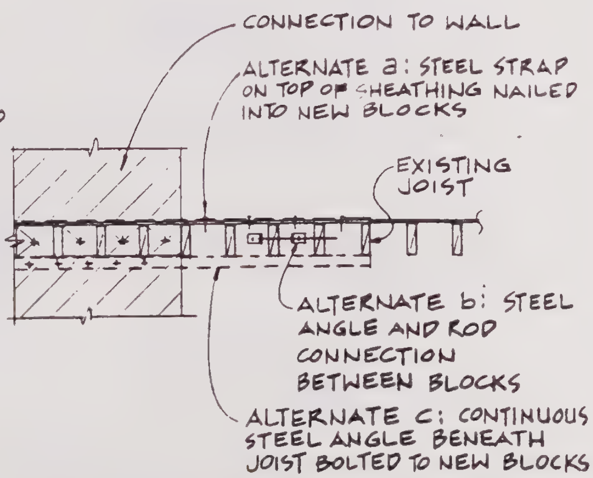
Strengthening Activity 13: Collectors

Collectors or drag struts transfer concentrated horizontal forces from a diaphragm to a lateral force resisting element such as a masonry wall or a new shear wall or frame. They are often required at reentrant corners or other building configuration irregularities, but they may also be needed to transfer shear forces to any lateral-force-resisting element that does not extend the entire width of the diaphragm. The collectors shown below are used to transfer forces to the walls that originate in the diaphragm. The collector may be made of wood or steel; several possible types are shown for two cases: 1) when the collector is parallel, and 2) when it is perpendicular to the joists. Often, the collector is added when a new floor or roof diaphragm (see Activities 7 and 11) is applied. When only the collector is added, some patching will be required at the wall and floor finish locations. The extent of patching will depend on the difficulty of installing the collector, but in most cases, the disruption to occupants will be minor, brief and localized.



LOCATION IN BUILDING



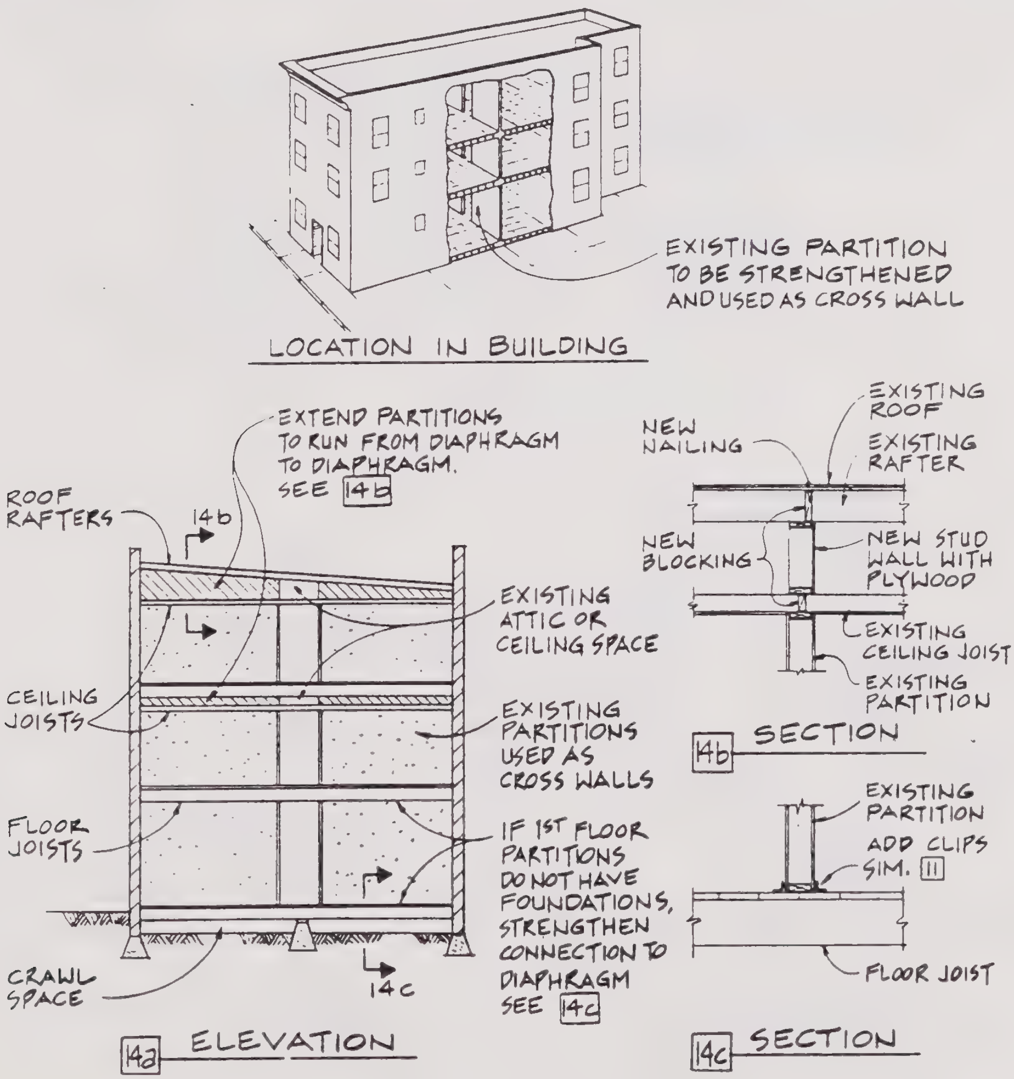


13a COLLECTOR PARALLEL TO JOISTS

13b COLLECTOR PERPENDICULAR TO JOISTS

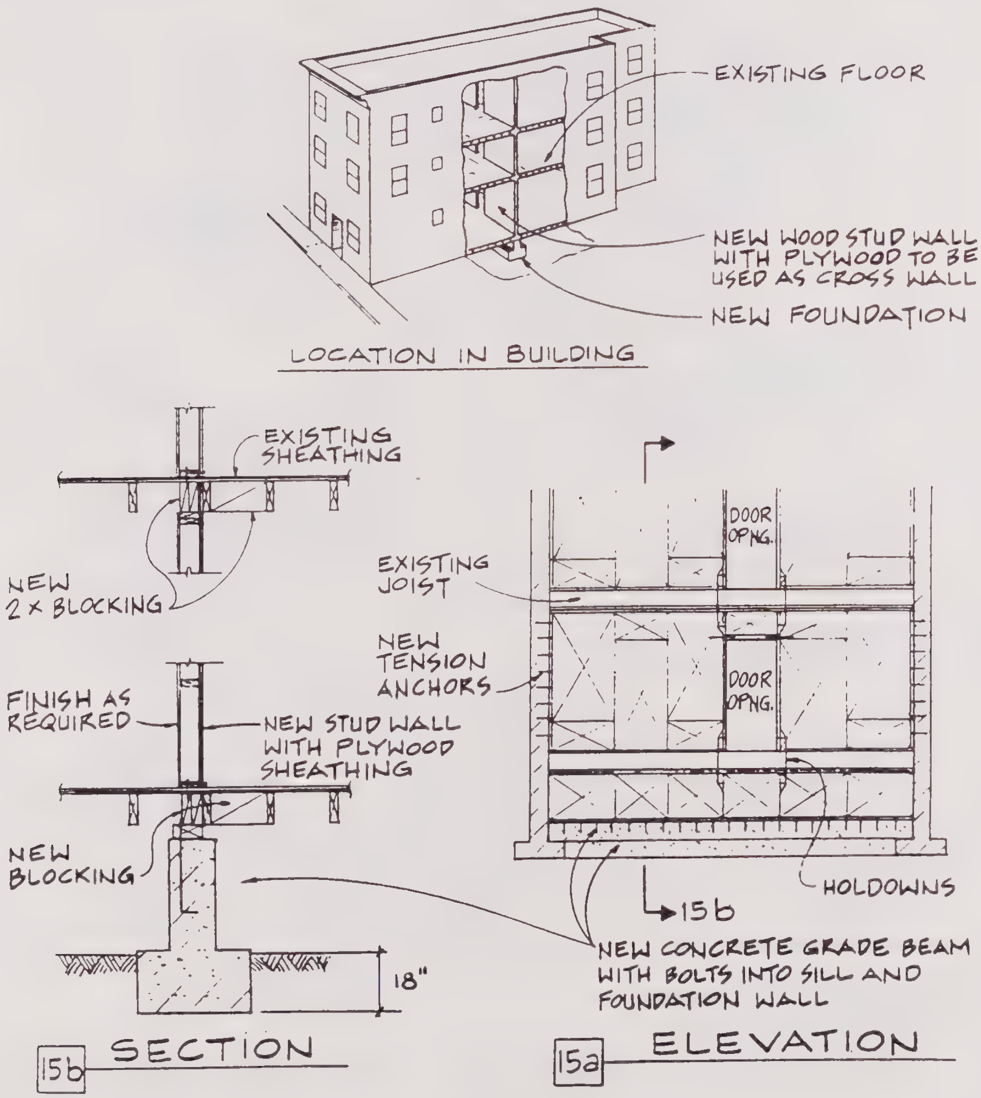
Strengthening Activity 14: Strengthen Existing Crosswalls

Certain buildings, such as those with residential and office uses, may have a large number of internal wood stud wall partitions that typically have plaster finishes. Research by John Kariotis (1981) [ABK] showed that these partition walls, called crosswalls, serve as energy-absorbing, displacement-inhibiting dampers during seismic loading. Their effect on lateral resistance is considered under codes derived from the ABK research, such as the Los Angeles Rule for General Application (RGA), and the proposed Uniform Code for Building Conservation - Appendix Chapter I. **When existing partitions are used as crosswalls, they must connect diaphragms together. Consequently, small new stud walls may be necessary in ceiling and attic spaces to make the crosswalls vertically continuous.** In other circumstances, the direct connections of the crosswalls to the floor and roof diaphragm must be verified and/or strengthened. The disruption to the building occupants during this retrofit work will generally be brief and localized.



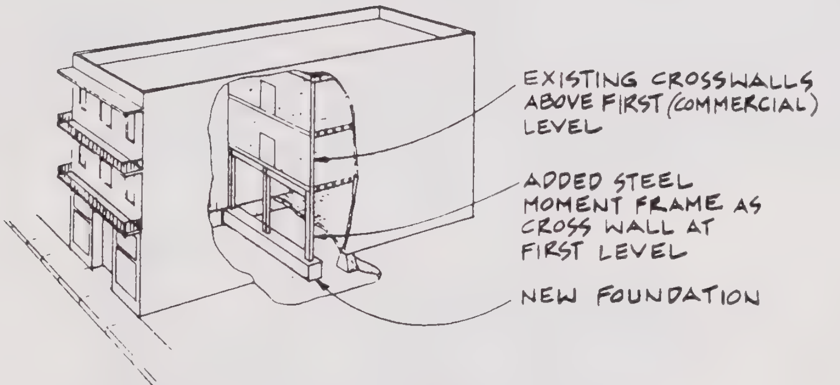
Strengthening Activity 15: Plywood Crosswalls

Similar to the result from strengthening existing crosswalls (see Activity 14), new walls can be added as energy-absorbing displacement-limiting dampers. Such new crosswalls are constructed of wood studs sheathed with plywood. Any finish may be placed over the plywood; standard gypsum board is most commonly used. Code requirements are more extensive for adding new crosswalls than for strengthening existing partitions. For example, new blocking may be necessary in the floor and roof framing, connections from the crosswall to the walls and diaphragms must have a minimum strength, and new foundations are needed. Since new walls and foundations are being added, interior space arrangements will be altered and restricted, and disruption during construction could preclude occupancy, particularly in the area where foundations need to be upgraded.

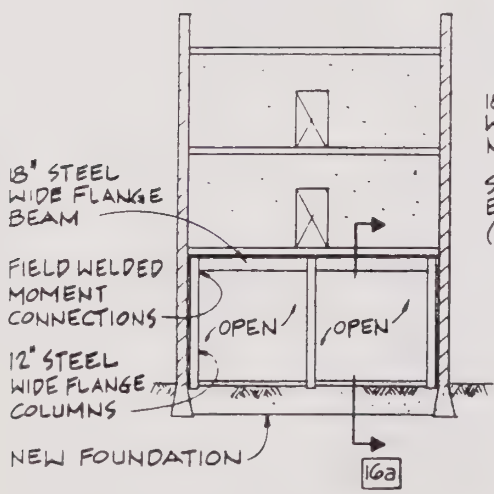


Strengthening Activity 16: Steel Moment Frame (As A Crosswall)

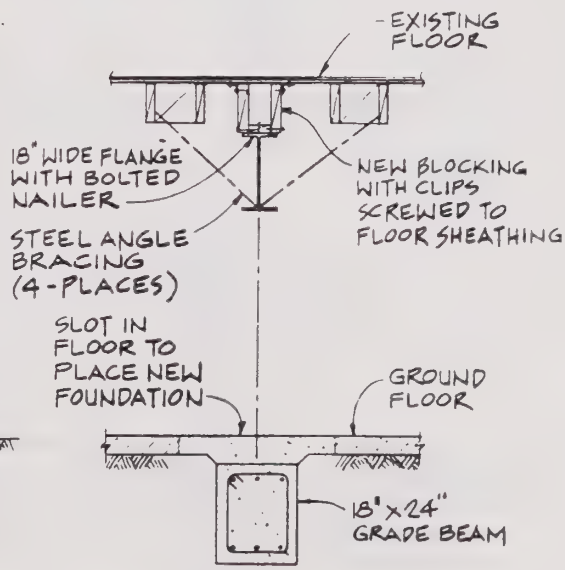
Many multi-story buildings have open, commercial spaces on the ground floor, with offices or residential units on upper levels that contain many partitions. While the partitions above can be used as crosswalls, the functional requirements of the commercial first floor may prevent the addition of a plywood crosswall. Instead, a steel moment frame, composed of beams and columns welded at their joints, can be used to retain the open space. Specific design requirements must be met to qualify the frame as a crosswall, rather than a moment frame used as a lateral element (see Activity 20). Because field welding of the frame components is necessary and a new foundation must be added for the frame, erection will be disruptive, and occupants cannot be in the immediate area during construction. The second floor will also require some work to connect it to the first floor frame, and several steel angles bracing the new steel beam may be visible after the work is completed. The frame can be left exposed if fire resistance requirements permit or facing material can be applied.



LOCATION IN BUILDING



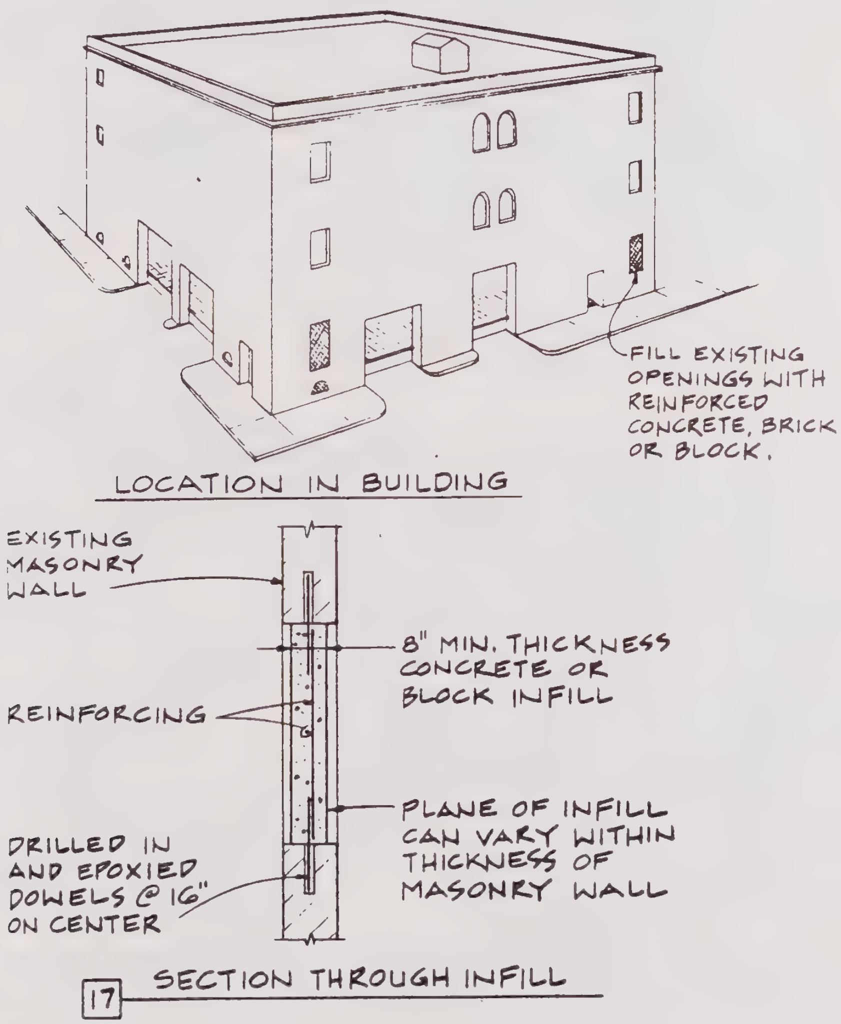
16 ELEVATION



16a SECTION

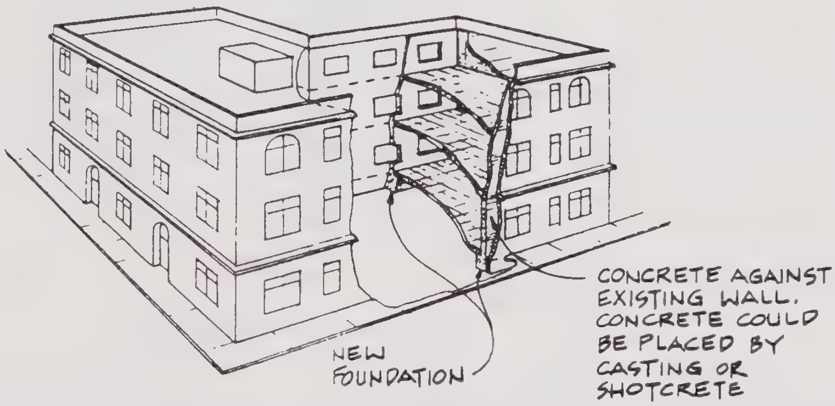
Strengthening Activity 17: Infill Openings

With this activity, window and door openings are filled to increase the shear capacity and reduce the stresses on the unreinforced masonry wall. The opening is filled, not with unreinforced masonry, but with reinforced concrete, reinforced concrete block, or reinforced brick. To connect the new material to the existing wall, steel dowels are installed in holes drilled in the surrounding masonry. Openings are usually filled when the requirements for stress reduction are low and when aesthetic preferences allow. It is important to recognize that infilling openings may, under some building codes, trigger the addition of automatic fire sprinklers. Code requirements concerning exterior wall openings and fire sprinklers should be examined during the retrofit design process. The exterior of the infilled openings can also be masonry to match the exterior wall, or can be detailed to maintain the appearance of a window. The disruption to occupants is localized and generally much lower than other in-plane strengthening methods such as Activities 18, 19 and 20.

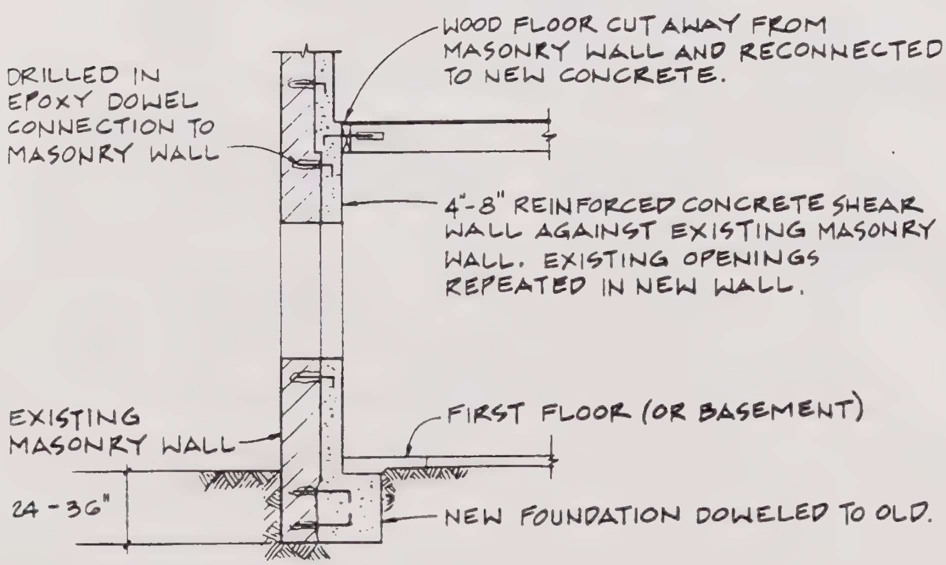


Strengthening Activity 18: Concrete Against an Existing Unreinforced Wall

New reinforced concrete is placed against an existing unreinforced masonry wall to increase the shear capacity of the wall. The new concrete is attached to the old wall with epoxy anchors and can either be cast in place with formwork or sprayed in place. Sprayed concrete is known as shotcrete or gunite. The thickness of the new concrete varies with strength requirements, but is usually from four to eight inches. Such new concrete can also be used to strengthen a wall against out-of-plane bending failures (see Activities 3 and 4), but this improvement alone is uneconomical. Vertical chases can also be created in the masonry wall by removing brick, thus forming deeper vertical ribs in the concrete wall. The new concrete can be placed on the inside or outside face of the wall. Locating the new concrete on the outside is less disruptive, and less expensive, but highly visible. When locating the wall on the inside face, the floors and roof must be cut away from the masonry wall and reattached to the new concrete. A new foundation must also be added and connected to the old foundation. The foundation shown below is minimal and assumes good soil conditions. Poor soil conditions would require more extensive foundation work. Underpinning and enlargement of the existing footing is sometimes employed. Deep foundations can be placed using drilled piers if access is available from the outside, or even from the inside with special equipment. Many unreinforced buildings (in some cities) have basements with direct access to the sidewalk which simplify the problems of constructing new foundations; however, very few buildings in the Ventura inventory have basements.



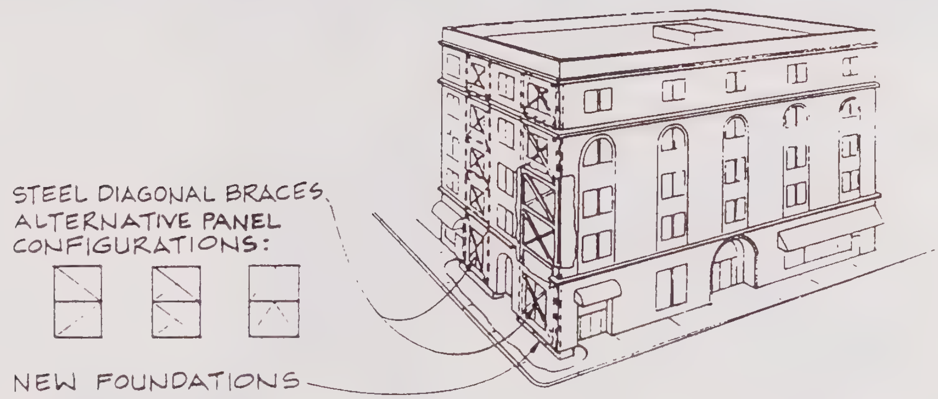
LOCATION IN BUILDING



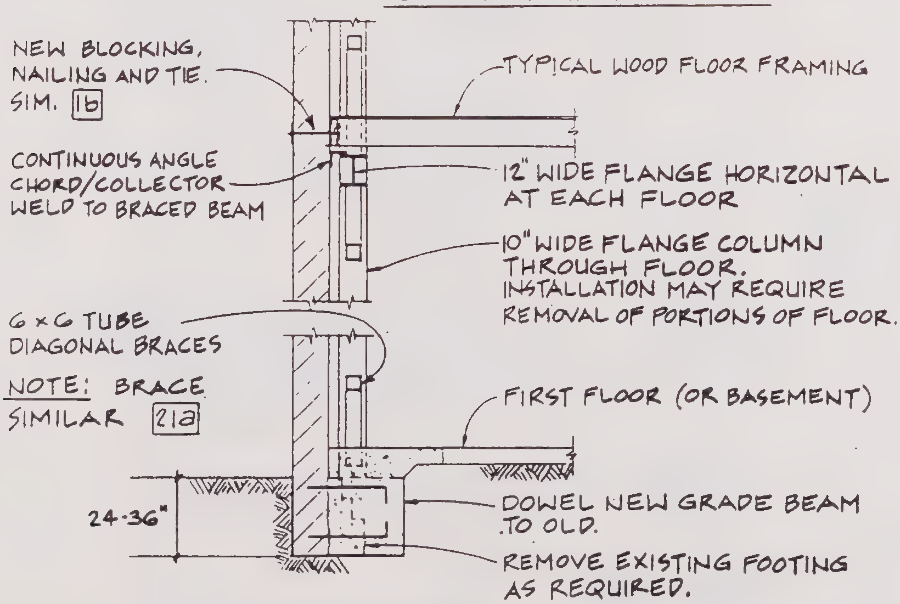
18 SECTION

Strengthening Activity 19: Steel Diagonal Brace

The addition of new steel diagonal braces decreases the in-plane lateral load demand on existing masonry walls. The braces, columns and beams can be constructed of a variety of steel shapes, including wide flanges, angles, pipes or rectangular tubes. It is also usually necessary to add collectors (see Activity 13) to bring lateral forces to the braces. Moreover, to transfer the forces from the braces into the ground, new foundations are inquired. The illustration below shows three alternate bracing configurations. Others are possible, though less common, and all configurations depend on architectural, as well as structural, considerations. Due to the relative expense involved, many owners choose to allow the braces to remain exposed to view; however, it is also possible to place them behind plaster or stud walls. The braces illustrated below are shown against an exterior wall; they may also be added at interior locations of the building. Braces must be attached to or pass through existing floor construction. This improvement involves considerable construction activity similar to moment frames and occupants must be moved from the location of the work. However, this activity will generally not be as disruptive as installing new reinforced concrete walls because it is not a "wet" process and does not generate as much dust. Installation of foundations would be similar to those required for Activity 18.



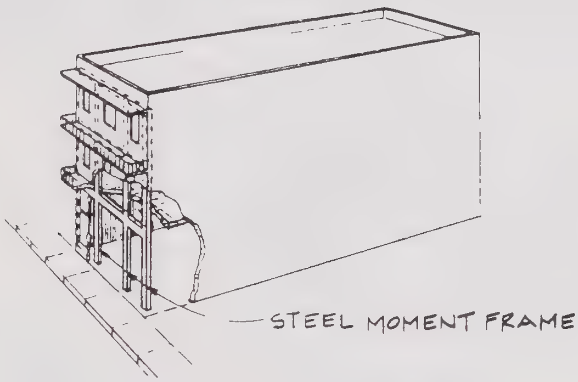
LOCATION IN BUILDING



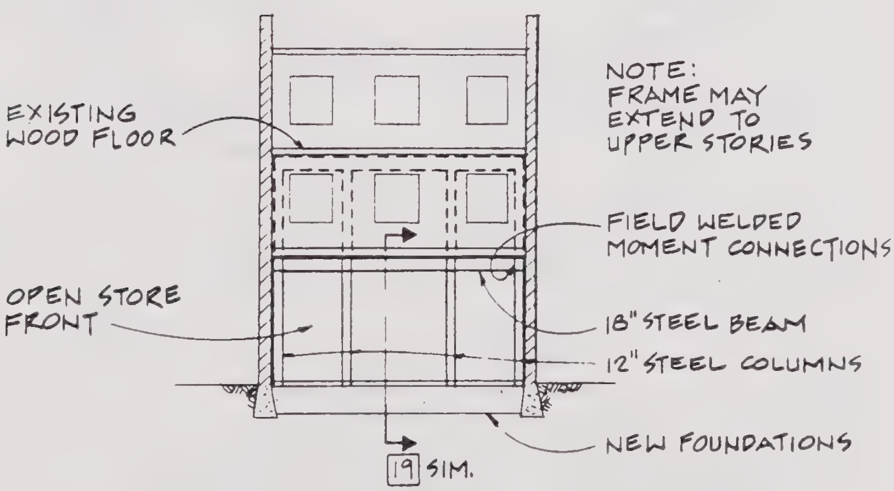
19 SECTION

Strengthening Activity 20: Steel Moment Frame (As A Lateral Element)

Many unreinforced masonry buildings have open fronts, with many windows and entry doors on the ground floor. They lack sufficient existing wall mass to be strengthened effectively by adding new concrete (Activity 18), and braced frames (Activity 19) could be aesthetically unacceptable or functionally restrictive. In these situations, a steel moment frame may be added to increase the lateral resistance of the front face of the building. Since moment frames are inherently more flexible than wall or brace elements, special consideration must be given to their design to assure structural compatibility with the building as a whole. Visually (and from an installation standpoint), an interior moment frame used as a "lateral element" is identical to a moment frame used as a "crosswall" (see Activity 16). If space on the lot is available, a moment frame could also be placed on the outside of the building. An exterior moment frame is generally less expensive and less disruptive to the building occupants than an interior moment frame.



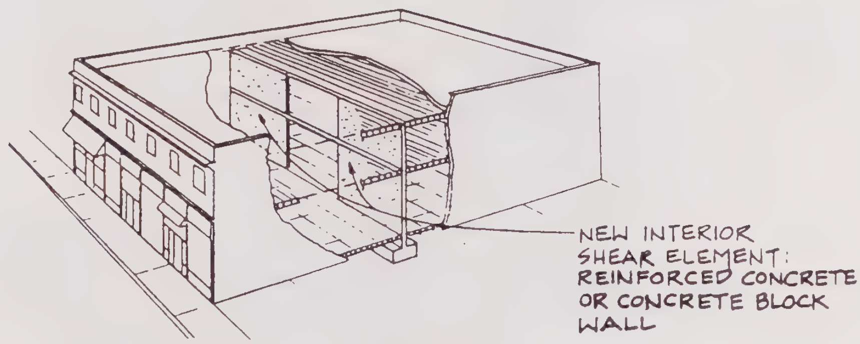
LOCATION IN BUILDING



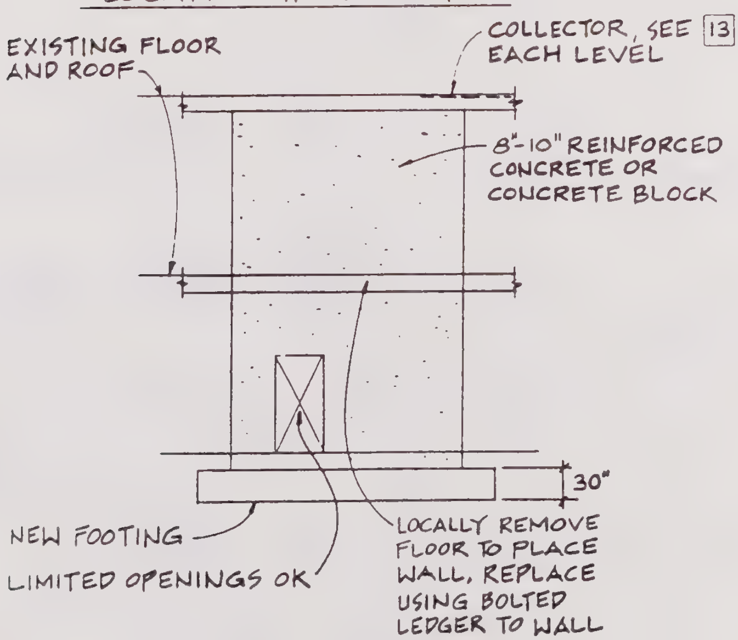
20 FRONT ELEVATION FROM INSIDE

Strengthening Activity 21: Interior Freestanding Concrete/Masonry Shear Wall

New interior shear elements can be added to reduce the demand on the diaphragm and on other shear elements in the building, such as the existing unreinforced masonry walls. The illustration below shows the addition of a new freestanding reinforced concrete or reinforced concrete block masonry shear wall at an interior building location. To carry forces to the new shear wall, collectors (Activity 13) are usually required, and new foundations must be added. A portion of the floor must also be removed to allow the new wall to pass through. Limited openings for doorways are usually possible. The primary structural difference between a new interior wall element and a new braced-frame element is that the shear wall is stiffer. The choice is generally made after consideration of overall compatibility with other lateral elements or fire requirements, after a review of the disruption that will result from construction, or on the basis of an engineer's preferences. As described in Activity 18, installation of concrete inside a building is highly disruptive. Adding concrete block is generally considered "cleaner," but it is still a "wet" process that requires placement of mortar for the joints of the block units and grout for the interior cells. Consequently, habitation of construction areas is usually precluded. New foundations are also required similar to Activity 18.



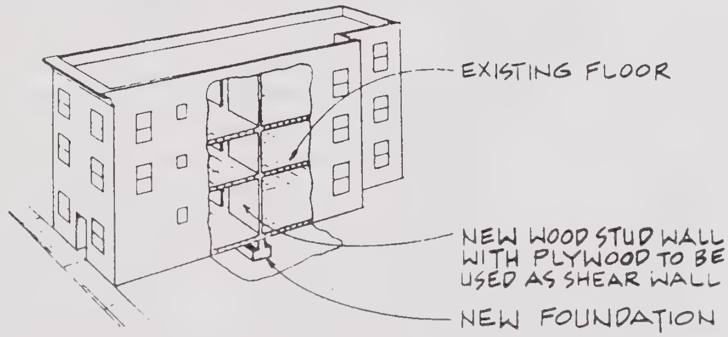
LOCATION IN BUILDING



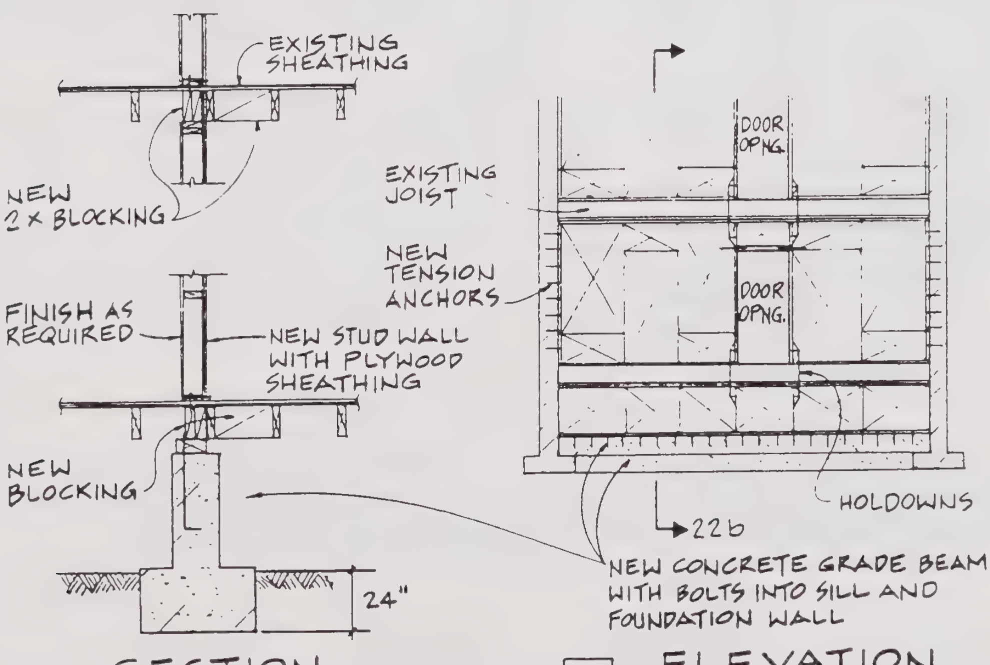
21 SHEAR WALL

Strengthening Activity 22: Interior Plywood Shear Walls

With this activity, new interior shear elements are added to reduce the demand on the diaphragm and on other shear elements in the building, such as the existing unreinforced masonry walls. Some seismic codes for unreinforced buildings -- including the **Level III** option studied in this EIR -- (other codes include the Los Angeles Division 88, or RGA and the proposed Uniform Code for Building Conservation - Appendix I) allow plywood shear walls to serve as new shear elements in unreinforced buildings. Codes based on traditional rules for new buildings, such as the Uniform Building Code, do not allow wood walls to be used as lateral elements for support of concrete or masonry walls. There are two possibilities to create a plywood shear wall: 1) existing partitions can be stripped to allow addition of plywood sheathing and improved connections to the roof and floor diaphragms, and 2) new plywood shear walls can be added. In both cases, finish work would be required. The disruption will be locally significant, but less than adding the concrete or concrete- masonry walls in Activity 21, or even the braced frame of Activity 19. New foundations are required but would be considerably less extensive than those described in Activity 18.



LOCATION IN BUILDING

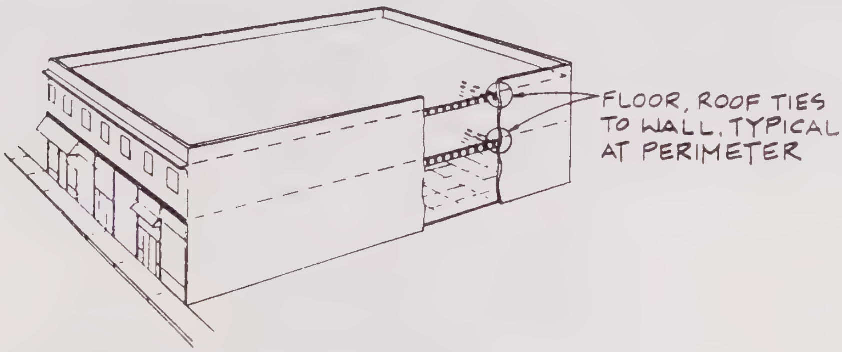


22b SECTION

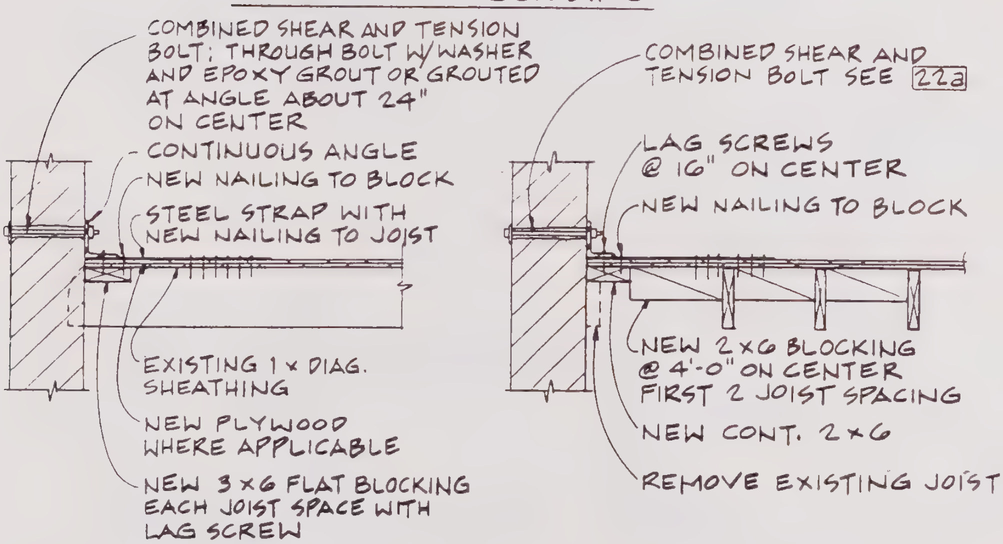
22a ELEVATION

Strengthening Activity 23: Combined Tension/Shear Anchors and Chords

Tension anchors, shear anchors and chords affect the same area of the building--the diaphragm edge near the wall. As a result, it is common to develop a diaphragm wall detail which incorporates all of these requirements. The steel chord member may not only help to carry midspan diaphragm flexural forces, but it can also be made an integral part of the shear and tension anchor details. Examples of such combined details are shown below. In these details, the chord is used to link the tension/shear bolt to the diaphragm.



LOCATION IN BUILDING



NOTE:

SIMILAR DETAILS CAN BE DEVELOPED TO PERFORM WORK FROM UNDERNEATH RATHER THAN FROM TOP.

23a JOISTS PERPENDICULAR TO WALL

23b JOISTS PARALLEL TO WALL

Level I and II Requirements: Applicable Strengthening Activities

The City of Ventura **Level I** and **Level II** upgrade requirements promulgated in the draft ordinance prepared by the City with the assistance of John Kariotis can be correlated with these strengthening activities. A **Level I** upgrade is confined to only strengthening Activities 1 and 2 and parapet bracing. A **Level II** upgrade involves activities 1 and 2 as well as 3 or 4, but only for some buildings (depending on the wall height to thickness ratio), and some selection of activities 17 through 23--also depending on individual building characteristics. There is considerable flexibility in how to design and implement stiffening open storefronts and strengthening shear walls parallel to an open storefront. Repairing and repointing existing masonry is an important finish activity that can also result in a structural improvement of a building's weight bearing capacity and seismic resistance design. This activity is also designed to mitigate non-parapet falling hazards (such as dislocation of an outer wythe of brick). **Table 3-3** summarizes the relationship between **Level I** and **II** upgrades and alternative strengthening activities.

Other than the City's **Level I** and **Level II** approach to strengthening, there are two other prominent alternative upgrade programs studied in the EIR that incorporate the range of strengthening activities described above. A **Level III and Level IV** option are also considered. These programs differ in the degree to which future earthquakes will result in building damage and each program is associated with variable levels of life safety enhancement. Prior to reviewing these other solutions to the upgrading problem and discussing the range of strengthening activities these solutions require, a summary is provided of the current debate about the two major engineering objectives of the unreinforced building upgrade movement: preventing loss of life and promoting building damage reduction. **In many respects, in deciding upon the proper level of strengthening to be required in the City of Ventura, basic questions need to be resolved about the design objectives of an upgrade. Is the goal only to minimize loss of life or is preserving some of the unreinforced masonry building stock also important.** This debate is summarized in the following discussion.

5.3 Defining Engineering Objectives: Life Safety Versus Damage Reduction

In comments on the Draft EIR, several individuals questioned whether a proposed ordinance should address only life safety goals or both life safety and building damage reduction. This question has been debated by engineering professionals for at least three decades. Moreover, there is no agreement about what specific strengthening activities provide the most effective life safety or building damage reduction efficacy. This issue is discussed in the following section.

Technical Standards and Upgrading Programs

The general technical approach to unreinforced masonry hazard mitigation programs established to date in the State has been to require strengthening to a standard lower than design objectives required for new buildings. In the process of complying with the State Unreinforced Masonry Law, local governments are deciding what level of risk is acceptable in strengthened buildings by balancing safety with economic and social constraints.

It is important to realize that the strengthening proposed for any type of ordinance option (with the exception of a Level IV upgrade discussed below) decreases but does not eliminate earthquake damage and life loss risks. Unless the most comprehensive and expensive type of upgrading is required, mitigation programs must be viewed as partial solutions, not complete solutions. The risk of damage to unreinforced buildings is far greater than the earthquake risk in new buildings; strengthened unreinforced buildings are more likely than new buildings to suffer earthquake damage that will not be repairable. The potential for deaths and injuries, economic loss, and damage in an earthquake can also be significantly higher for strengthened unreinforced buildings than for new buildings. However, engineering considerations -

especially the brittleness of unreinforced masonry - and the high cost of strengthening generally make it impractical to strengthen existing unreinforced buildings to higher design standards.

Considerable variation exists in both the technical and administrative provisions of mitigation programs throughout the State. These variations reflect that local governments have taken conscientious steps to design their programs taking the needs of individual communities into account. For example, unlike any other city, Santa Barbara has chosen to strengthen its buildings in a phased program, district by district to encourage coordination between owners and ultimately reduce and localize construction disruption. This phasing in modified form is being recommended by the consultant for Ventura. Administrative variations in implementing mitigation programs have been encouraged by the State Seismic Safety Commission as a way of involving the community. Perhaps the most common administrative variations have occurred in the time schedules for the compliance with seismic safety standards. The majority of these time schedules still fall within the Commission's suggested goal of issuing seismic retrofit permits by January 1, 2000.

Variations in technical standards have also been prevalent. Since there is no uniform standard for upgrading, most jurisdictions have sought to implement standards derived from one of five primary technical sources:

- The City of Los Angeles Division 88 Ordinance - Other jurisdictions have adopted various editions and allowed the use of the Rules of General Application (the ABK Method). The County of Los Angeles has a similar ordinance titled Chapter 96.

- The Uniform Code for Buildings Conservation (UCBC) - This code is recommended by the International Conference of Building Officials, but unlike the Uniform Building Code it is not referenced in State law as a "model code", and therefore does not yet have the encouragement from the State to be uniformly applicable. It is currently based on the 1985 edition of Division 88. This code has just been updated but the revised code has not yet been published.

- The Seismic Safety Commission's Recommended Draft Model Ordinance - The 1987 edition was based in part on the 1985 edition of Division 88. In February 1990 the Commission updated its Draft Model Ordinance to reflect recent UCBC code change efforts.

- The State Historical Building Code - This code is required by State law for historical buildings and allows for flexible standards to encourage their preservation. There are no detailed seismic provisions in this code.

- Earlier Editions of the Uniform Building Code - These are typically referenced for nonbearing wall URM buildings and other potentially hazardous buildings.

These variations have had several effects on the hazard reduction efforts to date including:

- The existence of conflicting standards have encouraged jurisdictions to explore many different alternatives.

- The diversity in standards have complicated and prolonged the program development process in some jurisdictions.

- The variation in standards has increased the cost and caused delays in the design, review, and construction because of the many and mostly minor variations in technical standards.

The range of technical issues and distinctions between various technical standards is reviewed in detail in the EIR Technical Appendix (as discussed in the following section).

In a few cases, local governments have lowered the above technical provisions to reflect their concerns over the cost of seismic retrofit or local variations in anticipated ground shaking. **The proposed Level I and II ordinance designed by John Kariotis is an example of an instance where a local jurisdiction has modified an existing technical standard to meet the degree of perceived risk in the community. The recent adoption of Assembly Bill 204 should result in standardization of upgrade methodologies and a decrease in local jurisdiction ordinance design.**

The building industry is tending toward more uniformity in technical standards, but it would take amendments to State law to encourage local governments to adopt uniform technical standards. The Seismic Safety Commission believes that variety in administrative standards is acceptable and can reflect the uniqueness of communities. But when it comes to the technical standards, the State as a whole would probably benefit from a uniform technical standard, which would promote lower costs, reduce design and construction delays, and allow more consistent education. **The adoption of AB 204 has now resulted in the definition of a single technical standard for the entire state.**

Upgrading Goals: Is There Consensus?

In analyzing retrofit alternatives and comparing existing codes and standards, a basic problem must be confronted: explicit and clear building performance objectives are generally lacking, either in the engineering literature or in the building codes themselves. For example, **the first sentence of the current draft version of the Uniform Code For Building Conservation (UCBC) appendix on existing unreinforced masonry buildings (ICBO, 1989-in progress) introduces an ambiguity over the design objective of the proposed code** with this language: "The purpose of this chapter is to promote public safety and welfare by reducing the risk of death or injury that may result from the effects of earthquakes on existing unreinforced masonry bearing wall buildings" (ICBO, 1989-in progress). The UCBC goes on to state what it will not necessarily achieve: "Compliance with these standards will not necessarily prevent loss of life or injury..." Other retrofit methods assert goals that are somewhat less encompassing than the UCBC intends. For instance, the ABK (Agbabian-Barnes-Kariotis) research project (which underlies the later phases of the Los Angeles upgrade program) and, specifically, the Los Angeles Building Department's Rule of General Application, is the origin of much of the content of the proposed UCBC, and of the SEAOC/CALBO Model Ordinances revised below. The ABK research explicitly establishes a goal of enhanced life safety, not property protection (ABK, 1984). **Where risk reduction is the objective, the important question is: How much reduction?**

Although not explicitly stated, there is a difference in the objective of the Los Angeles ordinance and the derivative UCBC or Model Ordinance compared with the objective of the seismic design of new buildings, as represented by the SEAOC Recommended Lateral Force Requirements and Commentary (SEAOC, 1988), or Blue Book, which has been the basis, almost verbatim, for the UBC's regulations over the past few decades. The first sentence of the Commentary portion of the SEAOC Blue Book sets out the purpose of the UBC's seismic regulations for new construction: "The primary function of these recommendations is to provide minimum standards for use in building design regulation to maintain public safety in extreme earthquakes likely to occur at the building's site. **The SEAOC recommendations primarily are intended to safeguard against major failures and loss of life, not to limit damage, maintain functions, or provide for easy repair."** The current (1988) edition, unlike earlier editions, hedges on the definition of "safeguard" by stating, "The protection of life is reasonably provided, but not with complete assurance." **This language reflects a probabilistic trend throughout the risk analysis and engineering fields during the past 20 years.** "Complete assurance," in probabilistic terms, would unrealistically mean 0.00% chance of failure.

The Limits of the Possible: Risk Reduction

It can reasonably be argued that risk reduction, rather than risk elimination or a guarantee of complete safety, is all the assurance that any standard can provide, even for new construction. It is also universally acknowledged that modifying existing buildings, especially unreinforced masonry buildings, to conform to current code standards is much more difficult than making a new project meet these standards. **However, this situation leaves unanswered the question of how much risk reduction a proposed ordinance should try to achieve or what the intended performance goal for upgraded buildings should be.**

A specific example of ambiguity in the basic public policy goals regarding unreinforced buildings was elicited by the 1987 Whittier Narrows earthquake, which tested a significant number of buildings that had received retrofits under the Los Angeles program. According to the observations of the Earthquake Division of the City of Los Angles Building Department (Los Angeles, 1988) the percentage of unreinforced buildings that had not completed strengthening projects which were damaged was 50% greater than the percentage that had been fully strengthened according to the City of Los Angeles ordinance. Likewise, the percentage of unstrengthened or partially strengthened buildings that had to be vacated because of damage was 2.7 times that of those that had been strengthened (Los Angeles, 1988). **These statistics indicate that the strengthening did achieve risk reduction.** No figures directly relate to the question of how much risk reduction was achieved, however, the type of risk in question in the Los Angeles ordinance is life safety, not dollars of repair cost or impacts of temporarily vacated units.

The report notes that "The purpose of Los Angeles City's ordinance for strengthening unreinforced masonry buildings is twofold: (1) To provide a maximum level of seismic resistance in these buildings, which is approximately 60 to 70 percent of current Code standards for new low-rise structures; and (2) to reduce the risk of death and injury during an earthquake..." What the authors of the original Los Angeles ordinance tried to avoid was the collapse of unreinforced masonry walls, especially bearing walls. The moderate intensity Whittier earthquake (5.9) of very short duration provided an important performance test for the unreinforced masonry buildings. There was no loss of life nor serious injury in unreinforced buildings nor was there a floor or roof collapse caused by a failing wall.

However, to ultimately judge the effectiveness of the Los Angeles provisions, it would be important to know how many strengthened buildings, in the areas where the intensity of this moderate earthquake was highest (approximately Modified Mercalli VII or in some cases VIII), performed in an unsafe manner. **The lack of fatalities seems to indicate safe performance; however, there were pieces of falling brickwork large enough to crush automobiles--but these failures did not happen to land on anyone. The damage was not tabulated in terms of whether it was life threatening or not, but primarily in terms of the property loss.** The absence of data collection in meaningful life safety terms--the terms of the ordinance--makes a fair judgement of the success of the ordinance difficult. In the literal terms of the ordinance's purpose it would be a success if there was any risk reduction, which there clearly was. **In meaningful engineering or public policy discussions, the controversy or debate centers around how much risk reduction was provided, and how this level of risk compares with standard benchmarks such as the seismic risk of new construction.**

Despite attempts at educating the general public and building owners concerning realistic performance goals for strengthened buildings, there is a common misperception that with virtually any level strengthening, a building has been "protected" and that large monetary losses from damage or building downtime no longer need be considered. This is seldom the case in practice. Unless completely backed with concrete, which is normally economically impractical, unreinforced walls will be susceptible to severe cracking and offsets which may be difficult to repair despite improvement in the structure through a strengthening program of some kind. Although monetary losses will undoubtedly vary with the level of strengthening utilized, it should be made clear to owners that damage in unreinforced buildings could far exceed damage comparable to new buildings. This knowledge is sometimes made explicit to public policy debates regarding the `tradeoffs' between the costs of a strengthening activity and its general acceptance politically.

The Hidden Agenda: Engineering Solutions and Cost Consciousness

A measure that is inexpensive, such as adding joist anchors to tie walls to diaphragms, has historically been noncontroversial, regardless of debates over its effectiveness, simply because the cost is low. Engineers thus may have developed some provisions with an explicit goal of not requiring what are perceived to be costly improvements. **If the strengthening objective is to achieve as much safety as possible without exceeding a certain cost level, then relatively simple strengthening activities will be promulgated.** The cost issue can be expressed by representatives of those who are most affected by costs: owners, tenants who receive pass-through costs, neighborhoods or districts where gentrification occurs, etc. **The cost issue as a policy concern has not been explicitly considered by engineers in their deliberations over proposed retrofit standards. Even prior to presentation of proposals to city councils or other decision-making bodies, some alternative provisions have probably been eliminated because of cost alone, even if there is engineering agreement over their effectiveness.**

Another parameter that has guided some engineering standards is conservation of building stock. **If a standard will have the practical effect of demolishing more buildings than are strengthened, many engineers will also begin to implicitly define acceptable risk low enough to avoid this cost.** From the late '50s with the Long Beach program, to the 1980s Los Angeles program, and into the 1990s, historical and architectural conservation has been articulated by groups who have this goal as their primary objective.

Another trade-off exists between retrofit disruption and seismic performance. Especially in residential buildings, there is a quantum jump in cost in terms of disruption between solutions requiring the space to be vacated and those which can be implemented while occupants remain in place. When considering this trade-off, the object is generally to provide as much safety as possible without passing the point of major disruption. In more complicated terms, these trade-offs can be regarded as continually varying combinations of cost and safety, with one combination eventually surfacing as the consensus, as a result of negotiations, successive revisions, and public debate. **In brief, there is no single proper approach to the problem and each community must weigh a variety of factors before committing to an upgrade requirement.**

5.4 Organizing Engineering Solutions: Current Proposals for Upgrade Requirements

Having reviewed some of the public policy issues that other jurisdictions have encountered in deciding on policy relative to competing design goals, summaries are provided of the major options currently being debated and adopted by other jurisdictions. **A complete discussion of the various strengthening programs and ordinance proposals being pursued statewide is provided in the EIR Technical Appendix. The purpose of the discussion in the Appendix is to provide the public and the decision makers with a sense of the wide variety of alternative strengthening programs currently being pursued in the State. These alternatives to the Level I and II approach considered by the City reflect a wide spectrum of engineering opinion about how to properly upgrade unreinforced structures.**

Technical information important for a complete understanding of the similarities and differences between various options has been included in the Technical Appendix. The general reader can omit review of the range of options considered in the Technical Appendix without a significant loss of comprehension regarding the four upgrade levels considered in the EIR.

The one important idea that needs to be understood regarding the proposed City of Ventura Level I and II upgrade programs is that the Ventura proposals described in the project description incorporate the basic theories of strengthening called the ABK Methodology.

One overall merit to the ABK Methodology as it has been incorporated into the City's **Level I and II** options is that the proposed City ordinance includes innovative engineering practices. There is also a major

practical advantage to the ABK methodology because the two retrofits that are among the most disruptive and costly can often be avoided when an existing unreinforced masonry building is analyzed with the ABK methodology (as incorporated into a **Level II or III** program). This method provides for: :

1. **Adding plywood sheathing to floors;**

2. **Installing braced frames made of steel or shear walls made of concrete or reinforced masonry (as opposed to adding plywood sheathing to existing partitions, which UCBC allows.)**

The three major disadvantages of this approach are:

1. **It is new, relatively untested in earthquakes, and has not yet subjected to as much independent statewide or national review as design provisions for new buildings;**

2. **It advocates a flexible lateral force resisting system for a stiff type of construction; some engineers are concerned that component stiffness incompatibility may cause damage despite the use of this methods; and**

3. **The specific level to which the life safety risk is lowered is inexplicit.**

Summary of Technical Data Regarding Ordinance Options

Review of the data included in the Technical Appendix section on ordinance options reveals that there are several distinct methods available for reinforcing unstrengthened masonry buildings. The differences in approach and results, costs and inconveniences, damage reduction and life safety enhancement, are quite variable. One of the most recently promulgated approaches (incorporated with some revisions into the Ventura **Level II** ordinance) has been exposed to relatively few empirical tests in the form of strong intensity, long duration quakes. Yet, this approach has several advantages, including a low cost - high safety enhancement benefit. However, although this approach has a single major objective - life safety rather than building damage reduction - evidence suggests that falling wall elements still will expose individuals on the street to significant risks. There is considerable disagreement among the experts regarding how to proceed in enhancing life safety through the retrofit process.

5.5 Strengthening Activities and Upgrade Programs Considered in the EIR

Having identified both the range of strengthening options developed by the engineering profession and how these activities have been organized into various model ordinances, the final portion of this chapter is oriented to defining what activities would be required for various levels of strengthening being considered by the City. Each of these upgrade levels is discussed below with reference to required activities, characteristics of construction, variations in construction activity by building prototypes in the Ventura inventory, and project duration.

LEVELS I and II: WALL ANCHORING, AN EXPANDED WALL ANCHORING PROGRAM, AND STRENGTHENING OPEN STORE FRONTS (Out of Plane Wall Strengthening)

Strengthening Activities

These strengthening options would require the least sophisticated upgrade program. The proposed Ventura **Level I** ordinance and a modification of this program, **Level I with out-of-plane wall strengthening** would result in relatively minimal disruption to occupants, and would cost less to implement than other options. A

Level II program would result in more tenant disruption and construction interference with the front of a building at the building entrance. The construction activities required by this alternative are limited to work that would be required to anchor unreinforced masonry walls to floors and roofs (Activities 1 and 2), and/or activities that are intended to prevent walls from collapsing perpendicular to their length, or "out-of-plane" strengthening (Activities 3, 4, and 6). Typically, these construction activities would be confined to the perimeter of the building along the exterior of unreinforced masonry walls. However, larger buildings may have interior walls of unreinforced masonry which must be similarly treated.

Although some wall anchors may exist from the original construction of the building or subsequent remodels, virtually all unreinforced masonry buildings in the City will require supplementary wall anchorage work if this option is adopted. In addition, most walls which fall outside the current limits of acceptable height-to-thickness ratios and would also require out-of-plane bracing between floors.

Characteristics of Construction

Retrofit projects using a Level I upgrade would generally be considered small, rarely exceeding $75,000 in construction costs even for large, irregularly shaped structures. Specific cost estimates for a group of buildings in Ventura have been provided in chapter 11. A small area within the building, preferably at the ground floor, should be provided in the contract for an office, staging, and storage location. The number of workers required by any one operation would probably not exceed three persons. Depending on the size and shape of the building and the project schedule, a contractor may choose to have several small crews working at the same time. Construction materials used would include bolts and hardware for anchors (Activities 1 and 2), and, where required, steel or wood studs or strongbacks for out-of-plane strengthening (Activities 3 and 4). Plywood and gypsum wall board might also be required, depending on the exact detail of wall anchorage and finishes to be matched.

In order to install wall anchors, the floor-wall intersection must be exposed. In almost all cases, this can be accomplished from either the floor down, or the ceiling up (see the illustration details of Activities 1 and 2). Building contents that are adjacent to unreinforced masonry walls typically must be moved, particularly when out-of-plane bracing is required. This could include manufacturing equipment, storage racks or shelving, built-in office or residential cabinets, furniture, appliances, or piping and conduit. If out-of-plane bracing is required, finishes or furring must be removed from the unreinforced masonry walls, or strips of finishes removed, in preparation for installation of strongbacks. In some cases where an elaborate or historical finish is present on both sides of a wall, the process of centercore drilling may be appropriate (Activity 4). If the building is vacant, finish removal would probably be done continuously through the building, in one operation. Preparation for installation of both strongbacks and anchors would be done concurrently, in any case, because their connection details at each floor are interrelated.

Following removal of necessary finishes, it may be necessary to reroute piping or electrical lines that interfere with the seismic strengthening elements. This work can be preplanned during design, but often unexpected lines are discovered beneath finishes. Of course, it is best to design strengthening elements to cause no such interference as they are costly and disruptive, but occasionally it is unavoidable.

Connections to the unreinforced masonry walls are made by drilling holes into or through the wall. Drilling equipment is used, rather than impact type, to minimize vibrations in the unreinforced masonry. If the work is done from the ceiling upward, small scaffolding may be required because it is difficult to drill into masonry from a ladder. Drilling is noisy and creates fine dust which is difficult to contain within construction boundaries. Bolts with plate washers on the far side, or bolts grouted in place complete the connection to the unreinforced masonry wall. Necessary hardware is installed, the strip of floor or ceiling replaced, and the work covered with new finishes to match the surrounding area.

The work required by a **Level I or II** upgrade is not too different from a local remodel. Short term noise and disruption from construction traffic as well as presence of fine dust from unreinforced masonry drilling and placement of plaster or gypsum wall board would be expected for several months after the work is

complete. This general level of disruption to occupants would be exceeded if welding of structural steel is required within the building. Ventilation must then be provided and equipment heavier than that generally associated with remodeling would be required. Such work, associated with installation of strongbacks or floor anchors, can normally be avoided with careful design, but will occasionally be required.

It should be remembered that old finishes, particularly wall finishes such as wallpaper, faded paint, wood wainscoting, and other elaborate trim, are often hard to match. When wall finishes are disturbed, therefore, the entire wall surface would likely require work to achieve a high quality finish. Floor finishes can cause similar match-up difficulties. This natural extension of minimum finish work will tend to enlarge seismic strengthening work into partial remodels. If low quality finishes are acceptable, mismatches could be left and finish work minimized.

Variations by Building Type

The installation of out-of-plane braces for buildings being used for industrial uses will often interfere with piping and electrical utilities running against the wall. Heavy machinery or storage racks may also need to be temporarily relocated, or, in some cases, special design measures may be necessary to avoid the interference in place machinery. On the other hand, industrial buildings generally have a low level of finish, and access to anchorage locations is adequate. The combination of low finish level, low occupancy, and a probable high tolerance to construction noise should allow retrofit construction to occur with full occupancy in most cases. Particularly disruptive work could also be scheduled at night or on weekends, although this would increase the cost of the retrofit.

To install out-of-plane wall bracing for buildings being used to commercial or retail activities, removal and replacement of finishes will typically be required and built-in cabinetry may also interfere with access to the floor-wall intersection. Because the work under the **Level I or II** upgrade alternative is localized at the unreinforced masonry walls, office work or retail areas could be temporarily vacated for 5 to 10 days to allow construction during occupancy. Similar to upgrading industrial buildings, particularly disruptive work, or work in sensitive areas, could be done at night or on weekends. To increase efficiency, plans should be made to vacate a small portion of the building during construction to create a staging area for the contractor.

Because buildings being used for residences generally have more partitions other buildings, gaining access to the wall-floor intersection to install wall anchors and installing out-of-plane bracing will affect more partitions (oriented perpendicular to the unreinforced masonry wall) and finishes than other building types. On the other hand, the small room size also affords natural opportunities to block off and seal construction areas for short periods of time if work is done while the building is occupied. Noise and construction traffic will make occupancy in adjacent rooms uncomfortable for the 5 to 10 days that the complete cycle of construction may take in each room. Residential buildings which feature small one-room facilities should consider alternate room accommodations for this short construction period. If plumbing or electrical distribution, kitchens, or bathrooms are against exterior walls, special seismic design details may be required to preserve acceptable living conditions in the immediate area of construction. Temporary dislocation on a living unit by unit basis will also occasionally be required for these reasons. Upgrade inconvenience with this level of strengthening is more severe for residential uses than other typical uses.

Occupied residential buildings also are more sensitive to interruption of utility mains than other occupancy types. Loss of power can cause food spoilage, and even a short interruption of gas service will require a costly and irritating procedure of relighting pilots. Contractors are also concerned about potential damage or theft disputes when working in an occupied residential building. In some cases, contractors will want third-party escorts to monitor their actions.

Project Duration

Average project duration for this type of upgrade would vary depending on the size, shape, and occupancy of the upgraded structure. Based on data generated for buildings in San Francisco, the estimated construction duration would be between 5 and 8 weeks, maximum. Actual displacement of any single area within a specific building would be about 5 to 10 days in the immediate vicinity of anchor installation. For projects without occupancy, project duration is generally proportional to project cost. Projects which will cost less than $25,000 would take about 4 weeks; duration for projects between $25,000-50,000 would be 4-7 weeks, and between $50,000-100,000, 7-10 weeks.

For this retrofit alternate, the time premium for continued occupancy (additional time required for completion given various constraints), according to contractors familiar with retrofit work for construction while a building is occupied, is estimated to be 25% for industrial uses, 40% for commercial and retail uses, and 50-60% for residential buildings. The residential uses group can be further partitioned into transient-type residential buildings such as hotels--the time premium for these buildings would be about 40% and permanent-type residential, such as apartments, 70%. In brief, the project duration is far greater with continued occupancy during the work period.

LEVEL III: STATE MODEL ORDINANCE
(Uniform Code for Building Conservation Appendix Chapter 1)

As explained in the EIR Technical Appendix and in preceding sections, the State Model Ordinance contains a special procedure and a general procedure. The general procedure is more expensive to implement, more disruptive, and is based on more conventional and tested engineering principals. The special procedure has, in one form or another, been widely adopted in southern California as a strengthening option. Nearly all of the buildings in the Ventura inventory would meet the tests in the Model Ordinance that enable use of the special procedure. The characteristics of this activity are described below.

Strengthening Activities

Retrofit projects generated by this alternative may require a broad range of the strengthening activities described above. In addition to the installation of wall anchors and possibly out-of-plane strengthening activities, the Model Ordinance would require supplemental evaluation and possible strengthening of the other building elements including upgrading or installing diaphragms (Activities 7-13) and creating in-plane shear load transfer and strengthening members (Activities 17-22). In the analysis procedures for Level II upgrades, existing plaster walls were considered as crosswalls which help to reduce the need for diaphragm strengthening. The presence of the crosswalls may also reduce the in-plane shear in the masonry walls and reduce the need for strengthening diaphragms.

Generally, only a percentage of the buildings in the Ventura inventory when improved to **Level III** standards will require strengthening of the roof diaphragm (a particular problem with industrial type buildings. Most floor diaphragms will be acceptable and not require additional strengthening. Diaphragm strengthening can be minimized by adding plywood shear walls. Additional crosswalls or shear walls can be installed to make the diaphragms effective. This trade-off will have cost and disruption effects that must be considered on a case-by-case basis.

In-plane strengthening of exterior unreinforced masonry walls may be required for walls in multi-story buildings. This reinforcement will be necessary in walls with window or door openings. All building faces with storefronts that have little or no solid wall (most retail buildings with open store fronts along Main Street, for example), will require some kind of in-plane strengthening element at or near the storefront wall. This may be accomplished by a rigid or braced steel frame or by a plywood or masonry shear wall (depending on the stress, number of stories and similar factors). A crosswall, which would serve to control

diaphragm deflection, could be located near the open front in some of the buildings instead of the shear resisting elements described above.

The need for in-plane elements in a retrofit project represents a substantial increase in construction activity when compared to a Level I upgrade. Construction activities for a **Level III** upgrade are more extensive than a typical remodel effort. **Level III** construction will usually require extensive removal of finishes, installation of plywood shear walls, new finishes and possibly installation of structural steel. In some cases, new masonry or concrete walls, or gunite over existing walls will be required.

The material used for strengthening, and the type and number of in-plane strengthening elements that will be necessary for any one building will depend not only on the building shape and dimensions, but also on other project parameters such as aesthetics, building function, or an interest in having continuous occupancy during the upgrade. It is anticipated that some activities required for **Level IV** strengthening may also, in some cases, be required for a **Level III** upgrade. These activities are likely to include the occasional use of steel diagonally braced frames (Activity 19) as in-plane elements, placement of shotcrete directly against the existing masonry walls (Activity 18), or infilling openings (Activity 17).

New freestanding interior crosswalls or shearwalls are disruptive to the function of both industrial and retail or commercially used buildings, but may be the most cost effective solution for some owners. Steel braced frames can be flexibly located, are less disruptive and lighter than concrete, but are difficult to conceal. Moment frames (Activity 20) are much more laterally flexible than walls and braced frames. Moment frames are also more expensive than braced frames and require considerable welding during erection. This type of frame has been used extensively in California for upgrading the front of open facade commercial buildings and it is also usable for architecturally sensitive spaces where intrusion has to be kept to a minimum. Moment frames may be the only solution for buildings with large open spaces like churches and assembly buildings.

The selection of an appropriate strengthening scheme under **Level III** upgrade requirements will be affected most by the specific limitations generated by retaining occupancy during construction as well as by architectural considerations. While it is always possible to keep the space occupied during construction in a **Level III** upgrade, there may be considerable inconvenience to the occupants and disruption of work. The actual amount of retrofit required under a **Level III** program will vary greatly from building to building. Costs for this alternative may vary from $25,000 to over $80,000 for the largest structures in the Ventura inventory.

Construction requirements are similar to **Level I** conditions: a work area is needed for the contractor; materials must be stored at the job site; the storage of anchor bolts, wood blocking and anchor ties will fit into typical construction storage boxes. Most large reinforcing pieces such as structural steel will be installed as soon as delivered, although some site fitup and welding seems always to be necessary for steel frames. Storage of finish materials like drywall requires more area than a construction storage box, but materials storage can typically be accommodated in any unoccupied space within a building. Delivery to the site will include large trucks and trailers, and, for short periods, cranes for structural steel installation. Excavation for concrete grade beams generally results in soil that needs to be removed from the site.

Strengthening of crosswalls and installation of plywood shear walls are similar activities. They both require the removal of the existing finish, attachment of anchors or additional nailing, and the placement of plywood, drywall or plaster (or all three) on the wall surface. These activities generate dust, noise and debris. When structural steel is installed, heavy components must be lifted, and welding or bolting in place is required. Holes are often cut in the roof and floors to permit columns to be "dropped in". Where moment frames are used, concrete grade beams will need to be installed. This will require excavation across the width of the structure, or portion thereof, to a depth of 3 to 5 feet and a width of 2 feet or more.

Variations in Construction by Building Type and Use

Industrial buildings usually permit the greatest flexibility in design and construction sequencing. However, industrial operations with clean room requirements are an exception to this situation. Installation of bolts, filing in openings and the addition of steel elements can usually be accommodated without significant distress. The concept of construction work in off hours is common in some industrial plant situations but off hour construction adds to the cost of the upgrade. If a new diaphragm is required, it can usually be installed from the roof. If the floor diaphragm requires strengthening, there will be disruption in occupied spaces. However, the appropriate placing of elements on the lower floor (if a building is multi-story) can eliminate the need for the floor strengthening.

In the case of buildings typically used for retail or commercial activities, the disruption to occupied spaces with **Level III** strengthening is less tolerable. The open or front wall is often ornate and open front (for merchandise display). Therefore, this wall facade obviously cannot be filled, and usually a steel frame is used to provide required shear resistance. This method of upgrade permits the finished space to function identically before and after strengthening. Removal of plaster, and cutting, fitting and drilling of wood blocking will create dust and noise. If a steel frame and grade beam need to be installed, excavation and soil removal, usually within the building perimeter, is required. Security for the open building is an additional concern. Some of the work could be done from the roof or floor above or below. This may permit many areas to remain occupied with only short interruptions.

Residential buildings, because they are always occupied (if in use), pose the most restraints to design and construction of **Level III** upgrades. Fortunately, in a Level III upgrade, most of the interior walls are used to resist the lateral force loads and frequently the walls in the upper floors of a multi-story building require no work. The walls of the top floor must be extended from the ceiling to the roof to act as cross or shear walls. At the lower levels, walls may require strengthening. This may require the installation of plywood. (Old plaster walls with loose plaster will require the plaster be removed and replaced before they can be accepted as crosswalls). The installation of the anchor bolts results in dust, debris, disruption and noise. In a residential occupancy, this activity may take several days and result in dirty, drafty spaces in the dwelling unit.

Project Duration

Depending on whether building occupancy is permitted during construction and depending on the size and shape of a structure, the duration of construction will range from a minimum of 6 to about 20 weeks of work. Without occupancy, the duration of the work could be as brief as 5 weeks and as lengthy as 15 or 20 weeks. With occupancy maintained, the work period is usually about twice as long as conditions without occupancy. In general, the projects in Ventura (less than $75,000 construction cost) would take about 6-8 weeks. For **Level III** strengthening, the time premium for construction while the building is occupied is estimated to be 25-50% for industrial use type of buildings, 70-100% for retail or commercial uses, and nearly 100% for residential buildings.

LEVEL IV: 1988 UBC STANDARDS

Strengthening Activities

Compared to other alternatives, this level of strengthening is clearly the most disruptive, the most expensive, and the most protective. Most retrofit projects completed under this approach to reinforcement would require the full range of strengthening activities described above. Installation of steel frames, guniting walls, replacement of existing flooring, and other major activities would be required in nearly all cases to achieve this design standard. Wall anchors and out-of-plane strengthening required under the **Level I** alternative would universally be supplemented by strengthening of diaphragms (Activities 7-13) and in-plane strengthening (Activities 17-22).

This alternative will also require strengthening of all roof diaphragms. Floor diaphragms will also require strengthening, although lower floors of multi-story buildings, floors in buildings with a very small footprint area, and floors with certain configurations of existing sheathing (multiple layers of sheathing, diagonal sheathing) may be adequate; exceptions would be unusual though and nearly all buildings would ultimately probably require this diaphragm work. In buildings with square or rectangular plan shape, it may be possible to strengthen only a one-room-wide strip of floor at the perimeter of the building, although if plywood is used, this could create a small step in floor elevation. In some buildings, diaphragm strengthening cold possibly be minimized by adding freestanding in-plane strengthening elements near the middle of the building; this trade-off would have cost and disruption effects that would need to be considered on a case-by-case basis.

In-plane strengthening of exterior walls would be required for virtually all buildings. All building faces with storefronts that have little or no solid wall would require some kind of in-plane strengthening element at or near the storefront wall. The need for in-plane elements in a retrofit project represents a significant escalation in construction activity. Not only would the retrofit construction activities far exceed the disruption and reworking of a "remodel" due to the introduction of substantial new structural steel or concrete elements, but also new foundations would be required. Foundation work is highly variable depending on the soils conditions and height of the building. In poor soils, the foundation can have a large effect on costs and construction activity. In many cases, foundation considerations will dictate that in-plane elements are more intensive (more in number or longer) than would otherwise be required.

The material, types and number of in-plane strengthening elements that will be appropriate for any one building will depend not only on the building shape and dimensions, but also on other project parameters such as aesthetics, building function, or an interest in maintaining continuous occupancy. In the City of San Francisco where many buildings have been strengthened under a related but less restrictive set of provisions [Section 104(f)], upgrades have employed steel diagonally braced frames (Activity 19) as in-place elements. A few have used shotcrete placed directly against the existing masonry walls (Activity 18), or infilled openings (Activity 17). The use of less expensive strengthening options (such as the use of plywood shear walls [Activity 22]) would not be permitted under the 1988 UBC code.

The configuration and pedestrian circulation arraignment in residential, commercial or retail use buildings will usually be seriously compromised by the adoption of this standard because these buildings often cannot retain existing openings and passages. Both the functional and aesthetic consequences of loss of outside exposure resulting from infilled openings is a serious problem associated with the adoption of this standard. Such effects can be minimized on industrial use buildings, however. The installation of freestanding interior concrete or reinforced masonry walls would be disruptive to the function of industrial and commercial buildings, but might be acceptable in residential buildings. In large footprint buildings, new concrete or masonry towers could be used for new stairs or elevators as well as shear walls. Concrete placed directly against unreinforced walls can solve both out-of-plane and in-plane deficiencies and can preserve the exterior appearance of the building, when this is desirable or required. Steel braced frames can be flexibly located, are less disruptive and lighter than concrete, but are difficult to conceal.

Moment frames (Activity 20) are much more laterally flexible than walls and braced frames and would therefore be considered inappropriate for use in unreinforced buildings by many engineers when using the conventional design philosophy that underlies a Level IV upgrade. Moment frames are also more expensive than braced frames and require considerable welding during erection. For these reasons, this type of in-plane strengthening would likely be used in only special cases such as architecturally sensitive low rise buildings with open fronts or in buildings with large open spaces like churches and assembly buildings.

In cities where **Level IV** type of upgrades have been conducted, nearly all the buildings strengthened have been upgraded as a result of a general remodel or change in occupancy and therefore buildings were vacant during construction. The detail of strengthening schemes used for a **Level IV** upgrade would be affected most by the specific requirements of occupancy during construction. For **Level IV** strengthening (other than

wall anchor installation activities), the construction area will have to be vacated and sealed off. The proportion of the building available to the contractor at one time will strongly influence choices between concrete and steel and location of in-plane elements.

Characteristics of Construction

Retrofit projects under **Level IV** strengthening requirements will require extensive construction work. Construction costs will typically be in the hundreds of thousands of dollars. If the building is vacant, a staging area could be contained within the building; a 2,000 to 3,000 square foot space would be needed. Large construction vehicles and equipment would occasionally need to be parked outside the building which may include delivery trucks, concrete mix trucks, compressors and even truck cranes.

Material that may be required would include all items included in Level I upgrading, plus structural steel, and concrete. Finish work would be more extensive, so considerable amounts of lumber, steel studs, plywood and gypsum board would need to be stored at the site, or frequently delivered. Suitability of access to the upper floors of buildings upgraded to **Level IV** standards would be an important construction variable. If a freight elevator is not available, access through windows would need to be developed, necessitating use of truck-mounted cranes or lifts, or temporary man/material lifts attached to the outside of the building. If work and delivery is not contained within the building, sidewalk protection tunnels may have to be erected. If the building is to be partially occupied during construction, separation of occupant and construction traffic would be necessary, including separate entrances, but such a separation is often impossible due to fire exiting requirements of the occupied spaces.

Installation of wall anchors and out-of-plane braces under this alternative would be identical to **Level II** and **III** upgrades. The extent of diaphragm strengthening required contributes to the differentiation between **Level IV** and **Level II** and **III** upgrades. Strengthening of diaphragms can affect every area of the building. All floor finishes must be removed in the area where plywood is required. Often wood blocks will be required to be cut to exact size and placed between joists. Plywood would then need to be installed over the existing sheathing and extensively nailed down. The area must then be refinished. Some finishes, like vinyl tile, will require that additional underlayment material is placed over the plywood before installation. In addition, chord members along walls (Activity 12) are most often required, which can affect all utilities that run vertically on the perimeter of the building. For example, rainwater leaders are often needed to be replaced or locally rerouted around the chord member. In irregularly-shaped buildings or buildings with "notches", collector members (Activity 13) may be needed, requiring additional areas of the floor to be opened up through the ceiling or floor sheathing. Diaphragm work is mostly carpentry, involving extensive sawing, hammering and nailing. Air-powered nailing guns are efficient and relatively quiet, but not all nailing is done this way and occupation of areas directly below diaphragm work will be unpleasant. Access to the floor structure from below may also occasionally be required.

The heaviest construction work in seismic retrofitting of unreinforced buildings is related to placement of in-plane strengthening elements. New foundations would almost always be required with **Level IV** upgrades and this work involves excavation and removal of soil, and placement of reinforcing steel and concrete. If access to the location of the new foundation is not available directly from the outside, then soil must be removed and materials brought in through the building. Secondly, in-plane elements always must penetrate the floors, which requires work on at least two levels at once, and creates temporary holes in the floors and often requires shoring of the floor structure until the element is installed.

Structural steel diagonal bracing is made up of steel members which can easily be 20 feet long and weigh over 500 pounds. Use of smaller members would require more extensive field erection work such as welding or bolting, but is often not possible. Movement of such large members is difficult once within a building, and contractors therefore attempt to gain access as close as possible to the final location. In vacant buildings, members have sometimes been placed from above, through holes in roofs and floors cut expressly for this purpose. Individual members are either bolted or welded together. A premium must be paid to install bolts without noisy power tools, and welding requires generators and fresh air venting of fumes.

Welding around the wood floors typical of unreinforced buildings also requires special provisions of fire protection.

Installation of concrete, shotcrete, or concrete block are all processes that involve the application of wet cement. Water is required in material preparation, placement, or cleanup. Preventing such water from affecting the floors below a work area when these underlying floors are constructed of wood is difficult. Cast-in-place concrete requires steel reinforcing bars to be placed and forms to be erected prior to placement. Steel reinforcing bars vary in size from one-half to one inch in diameter. They may be 20 feet long and normally can be carried by one or two men. Formwork is made in sections of plywood with wood stud backing. To be efficient, formwork sections are large and difficult to move around in a confined space. Concrete will typically be pumped through two- or four-inch flexible hoses from the street to the placement location. Similar to structural steel, the contractor will attempt to enter the building with the hose as near as possible to the placement location. Concrete block walls are constructed in a similar manner, using hollow precast blocks placed in a brick-like fashion as forms. Reinforcing bars are placed and a thin grout pumped inside. Shotcrete, or gunite, is normally used against an existing unreinforced wall, in which case no forms are required. The face of the brick wall is cleaned and roughened, and steel dowels are placed in drilled holes. After reinforcing bars are placed, the shotcrete material is pumped through hoses and blown in place. Because of the high pressure involved, venting to the outside must be provided. Cleanup after shotcrete work is extensive, as some material, called "rebound", does not stay on the vertical placement surface. The surfaces of concrete, block or shotcrete are seldom acceptable, except in industrial buildings, and are therefore often plastered or otherwise covered over. The work of installing these kinds of in-plane elements is difficult to confine in small spaces, and extensive barriers or protection walls must be erected to avoid damage to surrounding finishes.

Previous retrofits employing **Level IV** upgrades have generally, if not exclusively, been performed on vacant buildings. Although experience and refinement of strengthening techniques may prove otherwise, it is currently projected that nearly all projects upgraded to **Level IV** standards will require large building areas dedicated to the contractor. Preferably, buildings should vacated, but by phasing construction vertically, two floors at a time, or horizontally, when a building has wings or other natural separations, may be feasible in most cases. Vertical phasing would start at the bottom of a building and proceed to higher floors to prevent creating temporary decreases in seismic resistance during construction. The temporary seismic response of buildings using horizontal phasing must also be considered.

<u>Variation in Construction by Building Type and Use</u>

Buildings with industrial uses will probably afford the greatest flexibility for **Level IV** strengthening without generating undue temporary or permanent disruption of functions. Where manufacturing is involved, particular attention will have to be paid to machinery and utilities to maintain operations. Wall openings can often be infilled in these buildings to avoid addition of in-plane elements. However, many of these buildings have large footprints, and limitations on wood diaphragms, even strengthened, may require addition of interior freestanding in-plane elements. The most troublesome and disruptive strengthening activities associated with Level III upgrades-- including installing new plywood on floors (Activity 10 and 11), -- will be easiest in industrial use buildings. The general lack of partitions and floor finishes eases installation, and a higher tolerance to disruption often will allow this upgrade to occur while continuing building operations.

The basic characteristics of buildings in retail or commercial uses will affect their retrofit design and construction. Infilled openings could seldom be used to strengthen walls for buildings being used for commercial activities. Freestanding solid wall elements would probably be avoided in order to maintain maximum flexibility of use in office and commercial spaces. Moment frames may prove popular in smaller buildings so that openness can be maintained in retail spaces. Although noisy or disruptive work could be done at nights or weekends, the kinds of activities often required by **Level IV** upgrades, particularly adding plywood on floors and adding in-plane elements, are incompatible with commercial or office operations and it is expected that construction would require temporary vacating of a building.

CHAPTER 6

THE GEOLOGY AND SEISMICITY OF VENTURA COUNTY

Revisions to the Final EIR in Response to Comments on the Draft

Some modifications to this chapter of the EIR were made in response to comments on the Draft. Most of these changes served to elaborate on topics discussed in the Draft EIR. Specific additions to this chapter include

(1) a summary was provided of the Staal, Gardner, and Dunne report on liquefaction and amplification potential in the study area;

(2) additional explanation was also prepared to clarify the relationship between various scales of earthquake measurement used in the following chapters of the EIR;

(3) a discussion of the relationship between earthquake intensity and duration and types of building failure was included;

(4) a brief history of seismic events in the Ventura region was prepared and is included in this chapter (to the degree such a history is relevant to future earthquake events); and

(5) finally, a summary of recent seismic activity on the Pitas Point-Ventura and San Andreas faults was included to respond to questions about these faults raised in comments on the Draft EIR.

The purpose of this chapter of the EIR is to describe the potential for earthquakes to occur in the Ventura region based both on known faults that are local to the area and on more distant major faults whose movements, despite their distance from Ventura, could cause sufficient ground movement to damage buildings.

The second contribution of this chapter is to introduce some of the fundamental concepts that engineers consider when designing a building to withstand the movements of the earth. These concepts are important because they are used to establish design thresholds that become the construction objectives for building rehabilitation. Obviously, the greater the potential for a serious quake and the higher the probability that an earthquake is likely to occur soon, the more rapidly and comprehensively should reinforcement programs be implemented.

It is not essential to read or understand this chapter of the EIR to comprehend the results of the computer simulation of both reinforced and unreinforced building responses to the earthquakes modelled in chapter 7. However, a proper understanding of the model and the design problems posed by different types of earthquakes is necessary to make an informed decision about the relationship between the probability of a quake occurring and the amount of structural mitigation that should ultimately be required. Moreover, a controversy concerning the seismicity (the susceptibility of a region to earthquakes of various magnitudes) of Ventura has developed over the past several years and there are important differences of opinion regarding this subject. This issues are explored in this chapter.

6.1 Regional Geologic Structure

A knowledge of regional geologic structure is helpful in understanding the earthquake risk of individual faults. The Transverse Ranges Province of Southern California trends east-west, transverse to the

northwest-southeast trend of the adjacent Coast Ranges, the San Joaquin Valley, and the Sierra Nevada Provinces to the north and the Peninsular Ranges Province to the south. The east-west trending physiographic features in the southern portion of Santa Barbara and northern portions of Ventura County lie at the western end of the Transverse Ranges Province.

In the academic literature concerning regional geology, seismologists have suggested that California lies astride the juncture of two relatively rigid plates of the earth's crust that are sliding past each other in response to movement of subcrustal material (Atwater, 1970). The main surface trace of this juncture is the **San Andreas** fault. The same forces which are acting to move that portion of California on the western side of the San Andreas fault northward apparently also generate a number of other important faults as a result of this northwest trend of earth. In the southern Coast Range Province within Ventura and Santa Barbara Counties, these tributary faults include (among others) the Nacimiento, Ozena, Suey, and Little Pine faults.

Most of the recorded earthquakes and historic fault breaks in California have occurred as a result of rupture along faults in the San Andreas set of northwest trending faults; this suggests that most of the accumulating strain energy is being released along these breaks. Important exceptions in the Transverse Ranges include movement on an east-west trending fault beneath Santa Barbara Channel, which may have caused the 1925 Santa Barbara earthquake, movement on the Big Pine fault in 1852 during a large earthquake, and movement on the Santa Monica fault system during the Point Mugu earthquake of February 21, 1973 (Ellsworth et al., 1973).

In Ventura County, as indeed in most of Southern California, there is one seismic event which chiefly determines the requirements for design of buildings and other structures to resist earthquakes. This is the likelihood of another event on the San Andreas fault comparable with that of the 1857 movement. Unfortunately, there is a paucity of detailed information on the effects of the 1857 event, but this event is comparable, in terms of intensity and geographical extent, with the 1906 earthquake centered farther north on the San Andreas near San Francisco. By plotting several variables related to earth movements associated with a quake, seismologists and engineers can predict the degree of earth shaking which would be expected at given distances from the San Andreas fault. Obviously, with increasing distance from the fault, the ground movement effects are diminished. Using comparative data, seismologists attempt to predict ground shaking magnitudes and engineers attempt to predict and then compensate for the effects of these movements on structures. For the San Andreas, generally speaking, a structure designed to survive a repetition of the 1857 earthquake would be expected to withstand other similar events.

6.2 Important Faults in the City of Ventura and Surrounding Areas

The most important faults in the vicinity of the City of Ventura are illustrated on **Figure 6-1** and attributes of these faults are summarized in **Table 6-1.** Two of the most important faults in the City region include the Ventura-Pitas Point Fault and, of course, the San Andreas. Other important regional faults include the Big Pine, San Gabriel and Frazier Mountain Thrust, all of which converge near the northeast corner of Ventura County. All of these faults except perhaps the Frazier Mountain Thrust are considered to be active, i.e., are potential focal points for the occurrence of earthquakes and displacement of the ground surface.

Geologic and survey evidence indicate that stress is building up along the San Andreas Fault and, for this reason, it is generally conceded that within the next several decades the southern expression of the San Andreas will again displace; the resulting earthquake will probably be severe. Prediction of when displacement will occur is not possible at this time; however, it is likely that it will occur within 100 years and possibly much sooner. Important attributes of the faults that would potentially effect buildings in the City of Ventura are summarized briefly below.

- **Big Pine Fault** - The east-west to northeast trending Big Pine fault forms the approximate boundary between northwest striking faults and physiographic trend of the Coast Ranges to the north and east-west structures of the Transverse Ranges to the south. The Big Pine fault has been traced 53 miles to the south-

west from its intersection with the San Andreas fault. Jennings (1972) indicates that the eastern 43 miles of the Big Pine fault has had displacement during historic time. The displacement is believed to have occurred in 1852. A rupture length of 30 miles long suggests an earthquake with a magnitude of about 7 created this displacement.

- **San Andreas Fault** - The San Andreas, the principal active fault in California, extends for over 600 miles (1000 km) from at least the Salton Sea area northwestward to the Pacific Ocean near Point Arena. **Although at its closest point the trace of the San Andreas fault is located about 50 miles from the Downtown portion of the City of Ventura, a major earthquake on the southern segment of the San Andreas fault would subject the City to severe ground accelerations.** Two of the three largest (Richter magnitude 8 or greater) historic earthquakes in California have occurred along the San Andreas fault; these were the 1906 San Francisco earthquake and the less well known 1857 Fort Tejon earthquake.

- **Ventura Foothill-Pitas Point Fault** - The Ventura Foothill Fault is an east-west trending fault that crosses the northern section of the City near the base of the adjacent foothills. The fault is north dipping with reverse movement that has been mapped largely from aerial photographs (Sarna-Wojcicki and others, 1976). Movement of the fault has apparently formed a scarp in Holocene-age sediments. In 1978, an "Alquist-Priolo" Special Studies Zone" was imposed on the Ventura Foothill Fault by the State Geologist.

- **Oak Ridge Fault** - The Oak Ridge Fault is a northeast-southwest trending fault extending across the southern and eastern portions of the City. The fault has thousands of feet of subsurface displacement, but is poorly defined at the surface. Pleistocene sediments are apparently displaced in the subsurface; however, late Pleistocene and younger sediments are apparently not faulted (Hart, Smith, and Smith, 1978).

- **Country Club Fault** - The Country Club Fault is a northwest-southeast trending fault segment in the eastern portion of the City. The fault probably forms a groundwater barrier in the late Pleistocene alluvium (Hart, Bortugno, and Smith, 1977) indicating late Pleistocene movement; however, there is no evidence of more recent movement. In 1976 the Country Club fault was evaluated and not recommended as an Alquist-Priolo Special Studies Zone.

- **McGrath Fault** - The McGrath Fault has been mapped as a southern branch of the Oak Ridge Fault (Weber and others, 1973). Similar to the Oak Ridge fault, there is little evidence of the fault at the ground surface and no apparent evidence of displacement of late Pleistocene or younger sediments.

- **Red Mountain Fault** - Another fault that has the potential to result in significant amounts of ground shaking is the Red Mountain Fault, located north of and adjacent to the City's water filtration plant on North Ventura Avenue. The Red Mountain fault is considered to be an active fault and portions of it have been included in the Alquist-Priolo Fault Rupture Hazard Zones.

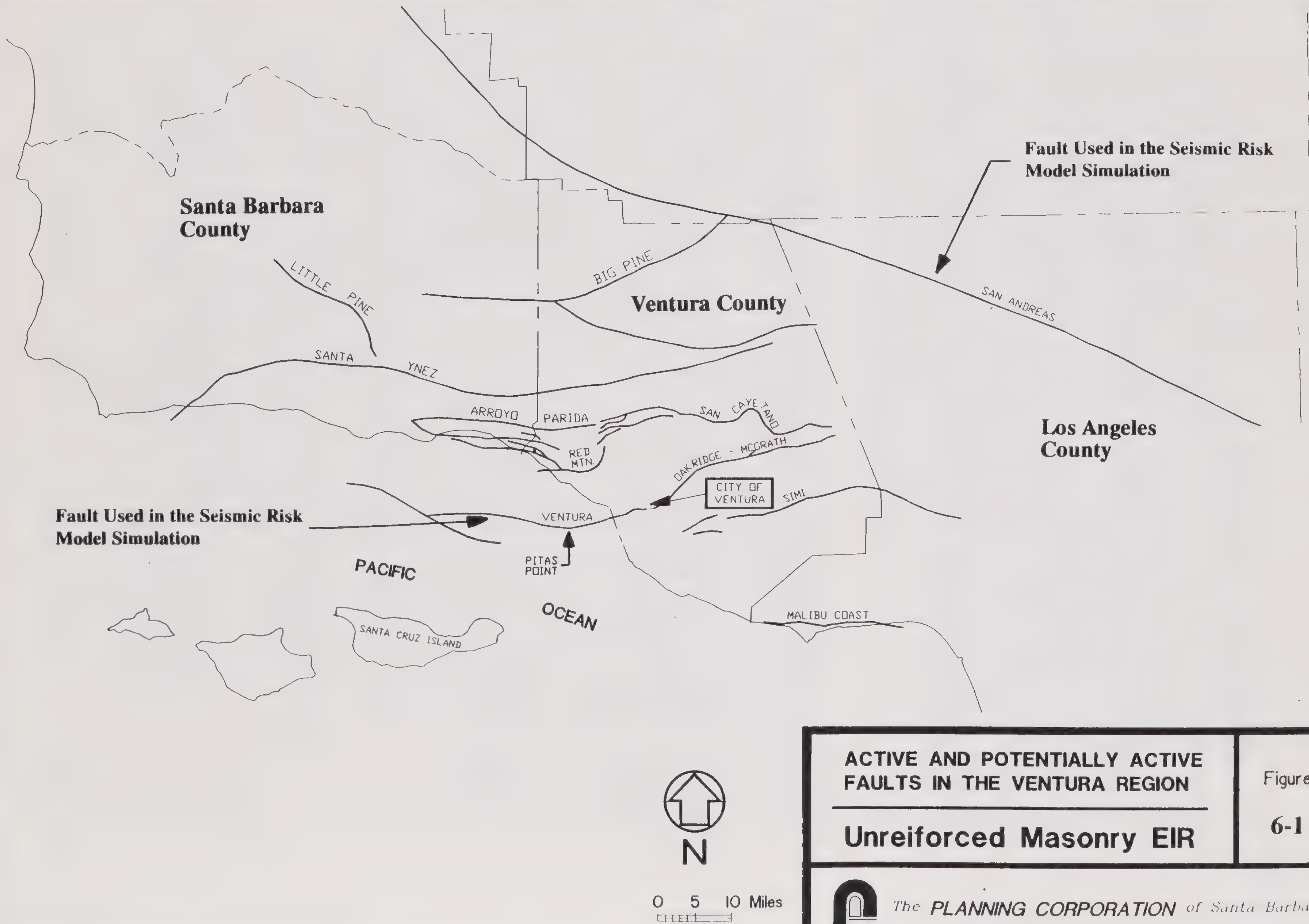
- o **Other Faults** - In addition to the above named faults, there is a conjectured unnamed fault located near the Montalvo Mound, east of Victoria Avenue. The presence and location of this fault is conjectural at this time and is the subject of ongoing study. Other features have been identified throughout the City that exhibit some of the typical characteristics associated with faults, such as long, linear features that are often identified only after careful study of aerial photographs. Some of these features could possibly be faults; however, insufficient study has been conducted to verify if these features are actually faults.

The most important seismic design related characteristics of these and several other important faults are summarized in Table 6-1. The faults that were used to model the response of the City's unreinforced masonry structures to several earthquake events are indicated in bold print in this table.

TABLE 6-1
Significant Faults

Fault	Approximate Distance From Study Area (miles)	Estimated Maximum Credible Earthquake Magnitude	Estimated Maximum Probable Earthquake Magnitude
Oak Ridge-McGrath	0	7.0-7.5	5.75
Ventura-Pitas Point	**0**	**7.0-7.5**	**6.5**
Red Mountain	0	7.5	6.25
Simi-Santa Rosa	5	6.5-7.0	5.75
San Cayetano	10	7.5	6.25
More Ranch-Arroyo Parida	10	7.5	6.0
Malibu Coast	15	7.5	5.75
Anacapa	18	7.5	6.5
Santa Ynez	19	7.5	6.0
San Andreas (Central)	**40**	**8.5**	**8.25**

Sources: Compilation of data from California Division of Mines and Geology (1975), Greensfelder (1974), and Black (1985) referenced in the County of Santa Barbara Seismic Safety Element (1985) and the City of Ventura Comprehensive Plan Update EIR (1990).



ACTIVE AND POTENTIALLY ACTIVE FAULTS IN THE VENTURA REGION

Unreiforced Masonry EIR

Figure 6-1

The PLANNING CORPORATION of Santa Barbara

6.3 Fundamentals of Engineering Seismology

Taking into account future earthquakes when designing new or retrofitting old structures requires reasonable engineering decisions concerning the effects of ground motion on buildings and the materials of which they are comprised. Consequently, a design engineer needs to know as much as possible about the nature of the seismic ground motions anticipated at a specific location during the proposed lifetime of a structure. Basically, the same information is needed about local seismicity whether the objective is new construction or designing retrofits for existing buildings that do not comply with current codes or were built with what now are legitimately considered "antique" building procedures. An engineer must know the location of a fault, what its destructive capability is, and how much turbulence the fault will create in the soil below a structure.

A **fault** is a fracture or fracture zone in the earth's crust along which there has been a displacement of the two sides relative to one another. The displacement may range from a few inches to tens of feet. Cumulative displacements along large faults can total several hundred miles over a long span of geologic time. A fault is generally described and classified by the orientation of its surface and by the direction of its movement. If the movement takes place abruptly along a fault (as is usually the case), an **earthquake** results.

The likelihood of major earthquakes on a particular fault can, in principal, be determined from geological, geodetic and seismological data, such as earthquake history, distribution of epicenters, strain level and rate, and the ages of fault displacements during the last several thousand years. Unfortunately, the geologic data are usually not adequate to estimate the expected frequency of destructive earthquakes on an individual fault (Ziony et al., 1973). The age of latest displacement on an individual fault is the criterion for determining potential activity which can be applied most consistently to a regional study of faults. Depending on the preserved geologic record, the recency of movement can be approximated for each fault from geologic or topographic features and historic data. The absence of historic and geologically recent earthquakes could indicate a large accumulation of strain energy and the consequent hazard of an impending large event (Allen, 1968).

The age of latest displacement is the most useful and easily applied criterion for estimating the future probability of an earthquake on an individual fault. As outlined below, faults are divided into four classes in order of increasing age since the last movement (modified from Cobarrubias et al., 1973). Geologists have created a set of conventionally assigned categories which are used to distinguish faults exhibiting recent movement (where more movement is highly probable) from less capable and inactive faults (where a recurrence of fault movement is very unlikely). The typology of faults include the following definitions:

- <u>Historically Active (HA)</u> - Faults for which destructive earthquakes within historic time are reasonably well documented are classified as historically active. In some cases earthquakes have originated on possible sub-sea faults or sub-sea extensions of known faults. Epicenters are not always well located, fault patterns are complex, and individual fault traces are discontinuous and have variable trends. Thus, assignment of historic activity on the basis of an earthquake originating on a possible sub-sea extension of a fault is considered speculative.

- <u>Active (A)</u> - Faults that show evidence of displacement during the most recent epoch of geologic time (Holocene or Recent epoch) are classified as active. Any topographic reflection of fault displacement is considered evidence that the causative fault is active because after 11,000 years such evidence would probably be obliterated by erosion and deposition.

- o Potentially Active (PA) - Faults which displace deposits of late Pleistocene age and show no evidence of Recent (0 to 11,000 years old) movement are considered potentially active. The late Pleistocene is estimated to span 11,000 to 500,000 years before the present (Ziony, 1973).

- o Inactive - Faults that only displace rocks of early Pleistocene age or older (500,000 years old or older) and show no evidence of more recent movement are classified as inactive.

The majority of faults in southern California are classified as inactive. Geologic mapping of a specific fault trend usually shows that the bedrock along the primary fault usually exhibits numerous other faults that splay off the main fault; these secondary faults are of various sizes and most have been quiescent for millions of years. Such faults constitute no significant earthquake risk. For engineering design, only faults within the first three categories (historically active, active, or potentially active) require consideration and judgement regarding the likelihood of occurrence and planning for the effects of seismic activity within the lifetime of a building.

6.4 Important Concepts used to Describe Earthquakes

There are two terms which are commonly used to describe the size of an earthquake, "intensity" and "magnitude", and each of these terms is supported by a considerable amount of theory about earthquake events, how often they may recur, and the degree to which earth movements will impact buildings. Each concept is considered briefly.

Earthquake Intensity - Intensity is an indication of an earthquake's apparent severity at a specific location, as determined by trained observers. [Note: In formal statistical terms, earthquake intensity is considered an ordinal variable--that is, the variable is not subject to precise measurement but can only be defined by the relative ordering of an impressionistic response. The only statistical manipulation possible with an ordinal variable is ranking whatever is being measured into relative order (very small, small, medium, large, largest....)]. Earthquake intensity is a measure of the effects of an earthquake determined through interviews with persons in the quake area, damage surveys, and studies of earth movements. Consequently, **intensity is a subjective measure of the size of an earthquake.**

The Modified Mercalli intensity scale is generally used in the United States to subjectively measure the effects of earthquake motion. This scale grades the effects into twelve classes ranging from I (ground motion not felt) to XII (nearly total damage). Intensity scales were originally used for the purpose of drawing seismic intensity maps which contained contour lines of equal seismic intensity. The Uniform Building Code seismic risk map (used to set structural design requirements for all buildings in the State) is assembled largely from such intensity maps of former, damaging earthquakes. Because the recorded seismic history is short relative to earthquake recurrence intervals, this method of prediction has serious limitations.

Earthquake Magnitude - Richter Magnitude is an arbitrary but calibrated interval scale which gives a measure of the total amount of energy released by an earthquake as determined by measuring the maximum amplitude produced on a standard recording instrument. [Note: In formal statistical terms, Richter Magnitude is an interval variable capable of being measured objectively using a specific set of measurement units with a known interval between each unit. Typical common interval scales include the metric scale used to measure distance and the pound scale used to measure weight]. The Richter Scale is a measure of the absolute size of an earthquake which does not consider the effect of the quake at any specific site location. There is no upper limit to the Richter Scale. However, since there is a physical limit to the amount of strain that rock can endure, it seems reasonable to postulate that there is an upper parameter for the magnitude of an earthquake. In California, this is generally assumed to be 8.5. The units of measurement in the Richter Scale are not equidistant (as in the inches in a ruler). Rather, they are related exponentially which means that with each increase in the Richter unit of measurement, the magnitude of the strength of the earthquake being measured increases dramatically. A difference of one unit in magnitude on the Richter Scale

corresponds to a factor of 31.6 to the amount of energy released. Consequently, **an earthquake of magnitude 8 represents an energy release approximately 32 times greater than that of a magnitude 7 earthquake and about 1000 times greater than that of a magnitude 6 earthquake. These differences in scale need to be kept in mind when reviewing the results of the computer simulation presented in chapter 7.**

Earthquakes of magnitudes 5.0 or greater can generate sufficient ground motion to be potentially damaging to structures. Design engineers are generally not concerned with earthquakes of a magnitude less than about 4.0 or 5.0, since they are of short duration and do not produce ground motion that causes serious damage to ordinary structures.

Richter Magnitude is a measure of the energy release in a given earthquake. For each earthquake, there is only one Richter magnitude but there are many levels of shaking depending on distance from fault and local ground conditions; for this reason Modified Mercalli Intensity (MMI) is often used to describe ground shaking at a given site. MMI is a scale used to describe earthquake effects at a particular location, so for any given earthquake there could be several MMIs. MMI is often mapped into regions of similar intensity.

It is possible to graph the relationship between the Richter Scale, the MMI scale, and the types of building damage that commonly occur to unreinforced structures. **Table 6-2** presents a comparison of Richter and MMI scales and **Figure 6-2** illustrates the relationship between earthquakes of various Richter and MMI Magnitudes and the onset of various types of building failure. This Figure basically describes the probable effectiveness of various types of strengthening activities (described in chapter 5 and evaluated in subsequent chapters).

6.5 From Measurement to Estimation: Important Concepts used to Describe and Predict Earthquakes

Since the lifetime of most engineered structures is limited to a few decades and because strong earthquakes are not an every day occurrence, it is important to be able to predict with at least some accuracy the **frequency** of earthquakes. Documented earthquake history is far too brief to permit reliable estimates of earthquake frequency on particular faults or in small regions. Consequently, when considering **recurrence intervals** or probability of occurrence, the calculations used to predict future earthquakes must be based on a statistically significant (sufficiently large) sample of seismic events. Considering the limited period that geologists have been making suitable earthquake measurements (about fifty years in California), the area that needs to be included in the sample used to predict recurrence must by physically very large to assure an adequate sample size for predictions to have any value. The carefully recorded recent history of earthquake movements throughout the entirety of Southern California is needed to provide a sufficient history of events for a seismically active region. Even an area of this size is not sufficient for calculating the probability of very large earthquakes.

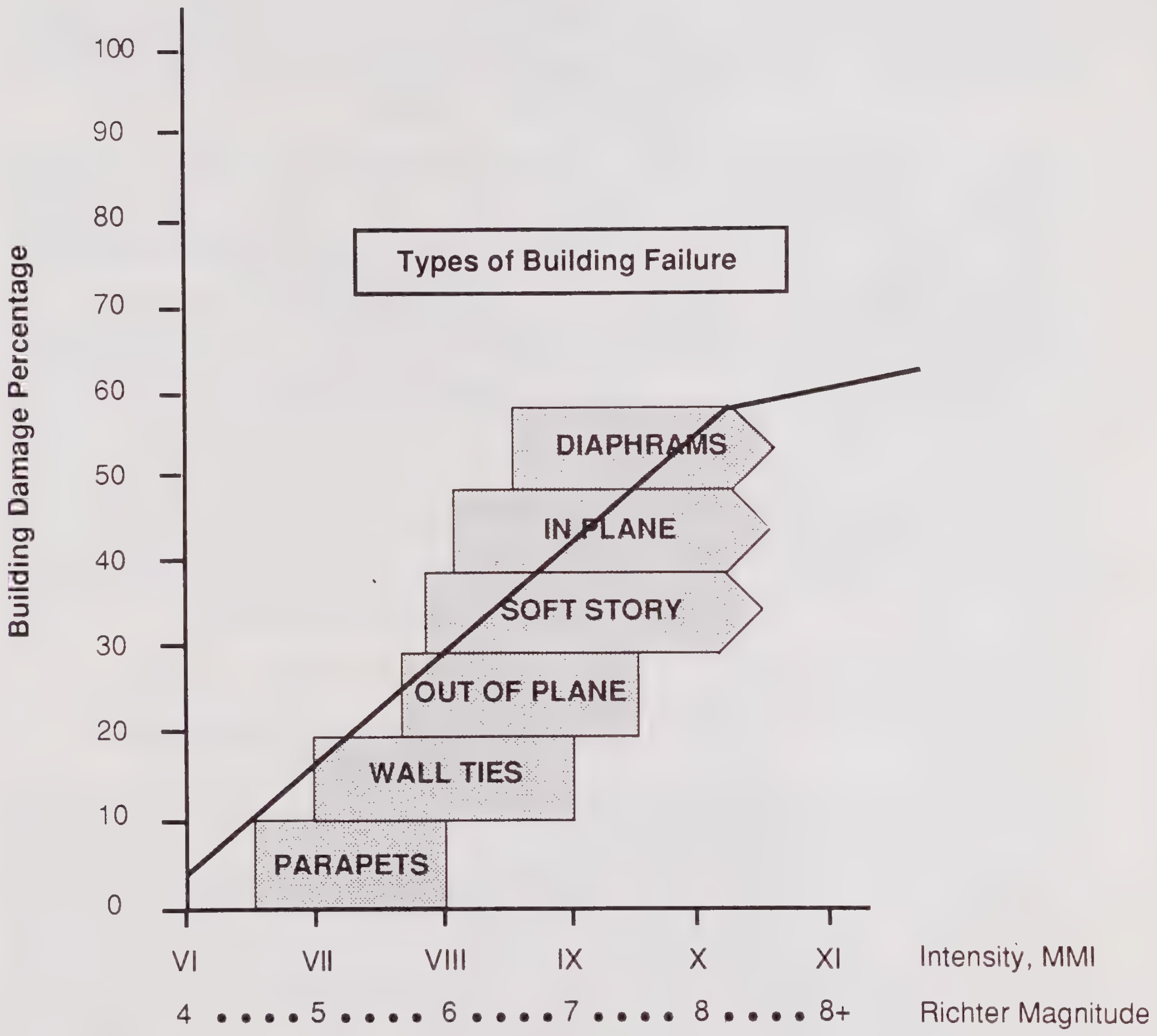
Available data for the region including Southern California and northern Mexico (100,000 square miles) over a 29-year period indicate the frequency distribution for magnitudes between 3 and 6.5 follow the same form as the distribution of world earthquakes. Assuming that the same form of frequency distribution can be used for California earthquakes up to about 8.5, Housner (1970) calculated the probability of a seismic event producing an acceleration exceeding a specific value at least once during a specific period. The accelerations were based on earthquake magnitude and an idealized relationship of motion attenuation with distance.

TABLE 6-2

COMPARISON OF RICHTER AND
MMI EARTHQUAKE SCALES

Richter Magnitude	MMI Value	Typical Perceptions and Responses
2	I-II	Usually detected only by instruments
3	III	Felt indoors
4	IV-V	Felt by most people; slight damage
5	VI-VII	Felt by all; most buildings vacated; damage minor to moderate
6	VII-VIII	Nearly all buildings vacated if occupied; damage moderate to major
7	IX-X	Major Damage
8	X-XII	Total and major damages

After Charles F. Richter, 1958, *Elementary Seismology.*



Ventura Unreinforced Masonry EIR

Probable Effectiveness of Retrofit Measures

Figure 6-2

The seismic risk of a fault can be defined best by determining the long-term recurrence intervals (interval in years between earthquakes) of earthquakes with a given magnitude. The recurrence intervals are calculated on the basis of long term slip rates of geologic units along the fault (Wallace, 1970; Clark, et al., 1972; Lamar et al., 1973). This approach can provide a basis for comparison of the earthquake risk of individual faults and has been used to estimate the recurrence intervals for major faults in southern California (Lamar et al., 1973).

To an observer located within the zone of influence of an earthquake, the earthquake is characterized by a rapid series of vibratory ground displacements. Because of convenience in seismic and engineering studies, it has been desirable and customary to record the time history of the earth's movement in terms of **accelerations**. It is this acceleration record or a suitable fabricated hypothetical acceleration record that is used in current seismic analysis and design.

A strong motion earthquake **accelerogram** is characterized in part by the intensity of accelerations, duration of strong shaking, and predominant natural period of the vibratory motion. These strong motion characteristics are a function of the particular earthquake and the location of the recorder both with respect to the geological and soil conditions, and with respect to the source of the seismic waves. Thus, **the major factors that appear to influence the type of earthquake motion felt at a particular site are the source mechanism, the propagation path characteristics, and the geologic and soil conditions at the site.**

Of the wide array of understandings that have evolved from the study of ground motion accelerations during quakes, several have important factors of particular relevance for unreinforced buildings that need to be taken into account when planning structural design solutions for these types of structures. Of most importance, geologists have determined that surface motion waves, which are more prevalent in alluvial deposits than in rock, decay less rapidly with distance than do body waves. What this means in simple terms is that soils that are unconsolidated or saturated (such as soils formed as the result of an interaction of ocean and river processes) can magnify seismic waves and generate more damage than would be predicted if the substrate were bedrock. This amplifying process was abundantly illustrated in the damage to unreinforced structures along the Boulder Creek flood plain in downtown Santa Cruz as a result of the recent Loma Prieta quake.

What concepts are used by geologists to measure and predict seismic waves at a specific location? The first concept, **maximum acceleration**, describes the maximum anticipated shaking at a particular location. Peak acceleration is not a particularly reliable measure of the strength of shaking exhibited by the entire range of acceleration records for a specific location--it reflects worst case conditions. The computation of maximum accelerations and the use of this standard in design has been in use for some time. The use of source parameters such as seismic movement, effective stress, and stress drop, are also relevant fundamental variables useful in the estimation of potential ground shaking in earthquake engineering; these measures are potentially more accurate than measures of maximum acceleration because they are physically related to the faulting process and to the resulting seismic radiation. These factors are presently the subject of intense research in strong motion seismology.

A number of investigators have proposed methods for determining bedrock or ground acceleration resulting from earthquakes. The previous investigations were reviewed by Seed, Idriss and Kiefer (1969) with the purpose of developing weighted average values applicable to California earthquakes. **These results were summarized in a set of curves relating earthquake magnitude and distance from causative fault to the maximum bedrock acceleration.**

A second important concept, the **duration of strong shaking** is an important characteristic of earthquake motion. **Both experience and theory indicate that the duration of strong ground motion is generally related to the structural damage during an earthquake.** The strong phase of shaking during the Parkfield earthquake of 1966 lasted only about 1.5 seconds, with a maximum acceleration of 0.5g, and very little damage occurred. However, the Taft (1952) and El Centro (1940) earthquakes with lower accelerations, but

a duration of strong shaking approaching twenty seconds, resulted in considerable damage. **The duration of a quake is especially consequential for unreinforced buildings. Buildings damaged by short, sharp quakes may exhibit relatively minor damage (parapet collapse, minor wall failure) but a sustained quake of equal intensity generates additional failures as shock waves course through the unreinforced walls and building corners. The more extensive damage to unreinforced buildings in Santa Barbara during the 1920s quake may well have been more related to duration than intensity. Long duration quakes are particularly destructive to unreinforced buildings.**

The duration of strong shaking has not been rigorously defined, and the determination of this parameter probably depends on the investigator. The general trend of current research is that duration increases with magnitude and also with distance from the epicenter due to wave scattering and dispersion. Two criteria used to distinguish the effects of duration are the time interval between the first and last acceleration peak which was greater than 0.05g, and the time interval between the first and last peak which was greater than 25-30% of the maximum acceleration.

The final concept useful in understanding the problem of seismicity and design is the concept of the **predominant period** of ground motion. This concept is presently defined as the period at which the acceleration response spectrum reaches a maximum. Assigning a predominant period to an earthquake record does not imply that the strength of the record is confined to a narrow range about that period. Except in very rare circumstances, the record strength is spread over one or several broad bands whose center can be approximately characterized by the peak acceleration response spectrum value.

As discussed in the following chapters, the interaction of soil conditions with seismic waves can have a very profound effect on building damage. Saturated soils subject to amplification of ground motion and soils prone to liquefaction can result in a significant enhancement of damage compared to the damage expected in areas where soils are firm. The soil interaction factors and building damage were very important influences on the degree of damage sustained by cities in northern California during the recent Loma Prieta earthquake (as summarized in chapter 8). In response to concerns regarding the potential for liquefaction and amplification in the City of Ventura, additional study of this issue is being done in tandem with circulation of the Draft EIR.

All of these concepts will be referred to periodically throughout the remaining chapters of the EIR.

6.6 Differences of Opinion about the Extent of Seismic Hazards in Ventura, California

<u>The City Commissioned ERTEC Evaluation</u>

Prior to finalizing a proposed ordinance for the City, in 1986, the City commissioned Earth Technology Corporation (ERTEC) to determine what the probable earthquake ground accelerations would be for the City of Ventura. This information was then used by engineer John Kariotis and the City Building and Safety Division to determine what specific structural requirements would be included in the proposed ordinance. **As a result of the ERTEC study, the proposed ordinance for Ventura was based on a predicted seismicity that is considerably less dangerous than the seismicity predicted for the Los Angeles area. This difference was converted into less intense upgrade requirements for such features as open storefronts, reduced support requirements for buildings with relatively high yet thin walls, and other features. Like the recently adopted Santa Barbara ordinance, the Ventura proposal is less restrictive than the adopted Los Angeles seismic retrofit law.**

The seismicity issue is extremely important because without accurate data about the type of earthquake events that may occur in the future, design requirements could be conceived that may fail completely to accomplish the life safety or building damage reduction objectives established by a jurisdiction.

During hearings in 1988 on the proposed ordinance, the ERTEC report was criticized by the public for being too liberal in its description of the region's seismicity. Some members of the public critiqued the

ERTEC report primarily because the predicted recurrence intervals for future quakes and the duration and magnitude of ground motion were thought to overestimate the problem.

To put this controversy into perspective, some of the significant findings in the ERTEC study are reviewed below. Italicized text was taken directly from the ERTEC report.

The specific scope of work for the ERTEC study

> *"consisted of computing probabilities of exceeding various levels of earthquake ground acceleration that might occur in the City of Ventura. The average return periods of these accelerations were also computed. In addition, the maximum credible accelerations were computed given the size and location of known active faults in the Ventura region."*

The model assumed that the order in which various quakes might occur and the places where fault movement was anticipated was a random process. *The basic assumption of the model is that the spatial location and the time occurrence of earthquakes within a particular seismotectonic province is completely random (i.e., Poisson process).*

Two separate sets of predictions were conceived in the ERTEC study:

> *"the seismotectonic provinces included in the analyses were: Western Transverse Ranges, the California Continental Borderland province, and Nacimiento-Rinconada province. The potential impact of a great earthquake on the San Andreas fault was considered separately".*

One of the more controversial aspects of the ERTEC analysis was based on the use of measured seismic records only for making the prediction of future events. This strategy limited the types of input to quakes that have occurred only during the past 50 years.

> *"The seismicity used to calculate the recurrence curves was based on the instrumental record of seismicity from 1932 to 1982. The magnitude range used in the probabilistic analyses was from 5.0 to 7.5. The lower limit was based on observations from past earthquakes concerning the lack of damage potential to structures from smaller earthquakes. The upper limit was based on the size of previous earthquakes and the length of faults in the provinces".*

Two other important concepts (introduced in the prior section) that were defined by ERTEC were the recurrence intervals of various quakes and anticipated peak ground accelerations associated with these intervals. The ERTEC report concluded that the probabilities of exceeding peak ground acceleration in 40 years and the associated average return periods were:

50 years	0.10 g
100 years	0.14 g
200 years	0.19 g
400 years	0.24 g,
600 years	0.28 g.

What these predictions say, in simple terms, is that with increasing distance from the present time, the potential size of peak ground accelerations increase with the passing of time. During the effective period of use of currently extant unreinforced buildings, peak ground accelerations to which these buildings may be

exposed would range from between .10 and .14 g. These values, one must remember, are predictions, statistical estimates, that must be accompanied by reasonable expectations of estimating error. In other words, these estimates are more than guesses about future conditions but they are also less than certain. Actual events could be more or less powerful than those predicted.

The ERTEC study separately considered the possible ground accelerations associated with the San Andreas Fault. The ERTEC study reported that

> *"based on detailed trenching investigations conducted at Pallet Creek on the central San Andreas fault, the average recurrence interval for a large earthquake on [the] fault segment [closest to Ventura] is approximately 160 years. Recurrence intervals based on surface geomorphology range from 140 to 300 years. The time elapsed since the last great earthquake on the central San Andreas fault segment (1857) is 126 years. Thus, another great earthquake on this segment of the San Andreas is quite possible during the assumed 40 year lifetime of the City's buildings. Based on the attenuation equation described above, the median peak ground acceleration in the City from a magnitude 8.25 event on the San Andreas fault at a distance of 65 km is 0.12 g. The duration of strong shaking would be between 30 seconds and several minutes depending on the precise location of the fault rupture and its characteristics. These results should be considered when establishing the appropriate ground motion acceleration for the seismic analysis of existing structures in the City of Ventura".*

Thus, for an event on the San Andreas fault system, ERTEC predicted that during the next 40 years, a quake of 8.25 Richter Magnitude would occur which would last between 30 seconds to several minutes resulting in a peak ground acceleration of .12 g for the Ventura area. But, what types of ground accelerations are predicted if a movement occurs on another fault system, one which is closer to Ventura? ERTEC also considered this issue. The report states that many *"major active faults are located near the City of Ventura. From the standpoint of seismic hazard, the more important faults are the Pitas Point-Ventura, Oakridge and San Andreas. The Pitas Point-Ventura and Oakridge faults are east-west trending reverse faults that are within approximately 1 km and 4 km from the City, respectively. Both of these faults are considered capable of generating earthquakes of magnitude 7".*

Comparing the effects of magnitude 7 quakes with the more intense events predicted on the San Andreas, ERTEC concluded that the *"San Andreas fault is much further from the City (65 km), and a great earthquake (MS = 8.25) on this fault would not generate ground motions in the City larger than those generated by a magnitude 7 earthquake on either the Pitas Point-Ventura or Oakridge faults"*. Thus, a worst case condition, using ERTEC data, would potentially result from movement on one of several active or potentially active faults. The seismic risk model discussed in chapter 6 confirmed this prediction.

ERTEC qualified this finding, however, with the following quid pro quo:

> *"The possible exception would be the very long period ground motions on the order of 10 seconds or longer, but these motions are well outside the period range of response of the City's buildings. However, the duration of shaking from a great earthquake on the San Andreas would be substantially longer than the duration of shaking resulting from a local earthquake of magnitude 7. Based on the attenuation equation given previously, the Peak Ground Acceleration in the City from a magnitude 7 earthquake on the Oakridge fault or Pitas Point-Ventura fault would be 0.4 g or 0.7 g, respectively".*

These levels of ground acceleration are very strong and would produce very damaging earthquakes. However, the likelihood of the occurrence of such an event in the next 40 years is considered unlikely.

Given all these sources of comparative data, ERTEC concluded: *"The results of this investigation suggest that 0.15 g has a reasonable chance of occurring in the City of Ventura in the next 40 years. This acceleration is probably the minimum that should be considered in the analysis and possible redesign of any buildings in the City. Because of uncertainties in the inputs and basic assumptions of the probabilistic model, the use of 0.2 g may be more reasonable".* This conclusion was followed by the additional suggestion that if it becomes feasible to evaluate certain structures for the maximum shaking considered possible in the City, then the appropriate level of ground motion would be a PGA (Peak Ground Acceleration) = 0.7 g.

Concerned about adverse public comments received on the ERTEC report during public hearings, the City commissioned an independent review of the ERTEC study by consulting structural engineers and engineering geologists at the firm Staal, Gardner, and Dunne, Inc (abbreviated SDG in the following discussion). The results of this review were released to the public and reviewed in a lengthy memorandum from the City Community Development Director (E. Millais) to Thomas J. Wood (of the Downtown Ventura Association). A synopsis of SDG's findings is provided below.

The SDG report was designed to be an independent review of the ERTEC report. The purpose of this review was to evaluate whether the methodology and results described in the ERTEC report are consistent with today's generally accepted engineering practice for seismic risk analyses.

Of the basic methodology used by ERTEC, the reviewers generally confirmed the approach adopted:

> *"The ERTEC report indicates that their seismic risk analysis was performed using a well-known, commonly accepted mathematical procedure to model earthquakes as random events (i.e., Poisson process). According to their report, their earthquake source model consisted of three large seismotectonic source provinces (each of which was hundreds of square miles in area) throughout which earthquakes were allowed to occur randomly. To estimate the rate of earthquake occurrence, ERTEC used the instrumental record of seismicity from 1932 to 1982, with some minor adjustments that they considered both reasonable and conservative. The attenuation relationship that they used to estimate peak horizontal ground acceleration was apparently derived from their own in-house linear regression analysis of available strong-motion earthquake data".*

The reviewers expressed relatively strong reservations about one aspect of the ERTEC study:

> *"Although we would consider both the general mathematical procedure ERTEC used to model earthquake occurrence and the attenuation relation they used to estimate peak horizontal ground acceleration to be generally reasonable and appropriate, we have significant concerns regarding their decision to use historical seismicity to model future earthquake occurrence. The reviewers went on to comment that the seismic risk source model is discussed only in very general terms and the report does not contain sufficient details to allow for a full assessment of the significance of the modelling assumptions they have made".*

This is a less serious problem than the issue pertaining to the use only of a recent 50 year seismic history in predicting future events.

The specific objections the reviewers had to the ERTEC report were:

"(1) The estimation of future seismicity using only the short (approximately 50-year long) instrumental record of historical seismicity in southern California is considered highly questionable and for the Ventura City area it is generally unconservative.

(2) *Such an approach disregards valuable geological and geophysical data that have been obtained in the Ventura County area and vicinity within the past decade or two. Studies of regions such as the eastern Mediterranean area and China, where historical earthquake records span 2,000 to 3,000 years, show periods of up to several centuries of quiescence alternating with equally lengthy periods of intense earthquake activity".*

The reviewers concluded that **it is therefore apparent that estimates of the frequency of future seismic activity based on short-term historical data are highly uncertain. Because a substantial body of geologic data is currently available for most of the significant faults in the vicinity of the City of Ventura, it is generally considered preferable to perform seismic risk analyses using specific significant faults as earthquake sources and to make estimates of the average frequency of earthquake occurrence based on long-term geologic evidence that spans the past few thousand years.**

The Staal, Gardner and Dunne (SDG) team, which had completed specific seismic analyses for buildings constructed in the Ventura area concluded that

> *"It has been our experience that seismic risk analyses in the City of Ventura area, that to use earthquake models based on specific fault sources, typically produce results that are significantly more conservative than those that were obtained from the ERTEC historical seismicity model. That is, the results of such geology-based source models typically show significantly greater peak horizontal ground accelerations than ERTEC's historical seismicity model did, for corresponding levels of risk".*

The reviewers concluded that the use of a *"geologic source model is expected to produce significantly larger peak horizontal ground accelerations, because currently available geologic data indicate that faults in the vicinity of Ventura have been significantly more active throughout the recent geologic past than the very short historical earthquake record would suggest".*

6.7 Probability and Certainty: What is Known? What is Likely?

Given the preceding review of conflicting opinions about the nature of the seismicity of Ventura, what should be done about the proposed **Level I and Level II** ordinance which appears to have been written based on a potentially significant underestimation of peak ground accelerations. Should it be revised to be more restrictive? This is an important question. **A miscalculation or underestimation of the seismicity used in creating design standards for reinforcement could potentially result in considerable private and public expense for upgrades that would fail to accomplish the desired objectives.**

To account for this problem without resolving it, the City could consider adoption of a proposed **Level III** (State Model) ordinance standard which takes into account more widely accepted predictors about regional seismicity in both northern and southern California. The additional strengthening requirements (beyond **Level I and II** recommendations) incorporated into a **Level III** ordinance are described in chapter 5. The life loss reducing and building damage reduction power of the **Level III** upgrade are predicted and illustrated in chapter 7.

Given the disagreements among experts about the future force and intensity of earthquakes that may impact buildings in Ventura, it is prudent to examine probable earthquake events and their effects on other communities. What would be the effects of underdesigning a strengthening program? This is accomplished in chapter 8 of the document. There is no simple resolution to the disagreement among geologists and engineers regarding the intensity of future quakes. The participating scientists themselves recognize that all of their predictions are probability statements which are subject to both error and miscalculation.

However, in planning a response to future earthquakes, decision-makers must do more than provide advice or compute probabilities. A municipality should choose a conservative approach to the problem of seismicity because, in an area with concentrated unreinforced buildings such as the situation which exists in the downtown portion of Ventura, the effects of even a moderate earthquake can be socio-economcially severe for the City and its downtown business community.

For portions of the City where such buildings are widely dispersed, another solution may be possible. Thus, **the uncertainty about geologic prediction will probably need to be translated into revisions in the proposed ordinance that establish different strengthening requirements for buildings in various parts of the City.**

The effects of underpredicting the severity of an earthquake and its effects on a single, relatively isolated building are very different from the same mistake made on a much wider scale. Therefore, where large numbers of adjacent and interconnected buildings are present in the City's building inventory, a more cautious and cooperatively managed program of strengthening is required. This possible solution will be discussed in greater detail in the Alternatives analysis (chapter 12). Since so little can be predicted with certainty about future seismic events and their magnitudes, the proper planning solution is to consider the effects of an error in either judgement or a mistake in the assumptions governing seismicity and decide whether, if such an error is magnified many times over, such an error is worth risking. Even a relatively rare event can be very devastating in a City with a high density of unreinforced buildings in its downtown core. The experience of the Loma Prieta quake documents this clearly.

6.8 Summary of Liquefaction and Soil Amplification Studies Performed by Staal, Gardner and Dunne

In response to questions about the applicability and specificity of information contained in the City's recently completed Comprehensive Plan Update EIR regarding soil liquefaction potential in the study area, the City retained Staal, Gardner and Dunne to perform a field testing program to determine how significant amplification and liquefaction problems might be if a mandatory retrofit program is adopted. A summary of the results derived from this study (Geotechnical Study: Assessment of Soil Liquefaction Potential in the Downtown Ventura Area, April 1991) are included in the EIR Technical Appendix. Copies of the entire report are available from the Ventura City Building and Safety Division. The following synopsis presents the important conclusions in the report.

Amplification of Ground Motions

Ground motions measures at a given site can be influenced significantly by the local soil conditions. Relatively recent ground motion data obtained during the Mexico City earthquake in 1985 and the Loma Prieta earthquake in 1989 indicate that peak horizontal ground accelerations recorded on soft soil sites were substantially larger than those recorded on stiff soil or bedrock sites. This is contrary to the relationship between bedrock ground motions and ground motions recorded on soft soil sites presented in the commonly used liquefaction calculations (Seed et al., 1976). Based on a preliminary examination of the recent soft-soil-site ground motion data, Idriss (1990) suggests that an alternative procedure for calculation of liquefaction and amplification factors should be used in arriving at estimates of peak horizontal ground accelerations on soft soil sites.

The downtown Ventura study area is underlain by an extensive thickness of relatively soft soil deposits. Data presented by Idriss (1990) suggests that the soil deposits in this area may result in amplification of earthquake ground motions especially at lower acceleration levels. Using the information presented in the Earth Technology (1985) study of the seismicity of Ventura and the Idriss calculation procedure, **amplification of the ground motions ranging from a 100 percent increase for the San Andreas event (M-8.25, a-0.12g) to a 38 percent increase for the 475 year event (M-7, a-0.24g) were determined to be possible. Thus, the amplified ground motions could range from about 0.24g for the amplified San Andreas event to about 0.33g for the amplified 475 year event.** These amplified values of PGA (peak ground acceleration) were also used as input values into the liquefaction analyses.

Liquefaction Potential

The liquefaction potential of the soil materials underlying the downtown Ventura study area were analyzed using the subsurface drill hole data, CPT sounding data, and laboratory data. Those data were used as input into the simplified, semi-empirical procedure for earthquake induced liquefaction assessment proposed by Seed et al. (1985). A description of the analyses is presented in Appendix D - Liquefaction Analyses of the Staal, Gardner and Dunne report. The results of the liquefaction and analyses suggest that there are some strata in the study area that may be potentially liquefiable under the conditions analyzed. Those strata generally occur in relatively thin layers (less than 5 feet thick) and they are typically overlain by a substantial thickness of nonliquefiable, cohesive soil materials. Soils were considered to be potentially liquefiable if the ratio of the cyclic stress ratio needed to cause liquefaction and the cyclic stress ratio induced by an earthquake was less than 1.25.

In general, the liquefiable soils appear to be limited to the granular younger alluvial fan deposits in the central and western portions of the study area. As discussed in Appendix C to the Staal, Gardner and Dunne technical report, the soils classified as sandy silts to clayey silts from CPT interpretations were considered to be nonliquefiable based on laboratory hydrometer and soil plasticity data.

Based on the limited data available for the older alluvial deposits, it appears that these older materials are not susceptible to liquefaction. However, considering the depositional environment of the Ventura River flood plain and stream channel, it is not inconceivable that localized pockets and layers of loose finer grained sands may exist in the western portion of the study area (i.e., west of approximately Figueroa Street).

Potential ground surface effects of liquefaction includes sand boils, ground cracking due to lurching or soil flow, and ground surface settlement. Studies by Ishihara (1985) have suggested that surface manifestation of liquefaction (i.e., sand boils and ground cracking due to lurching) is reduced or eliminated by the presence of nonliquefiable soil layers overlying the liquefiable layers. The apparent benefit of the overlying nonliquefiable layers becomes more significant as the thicknesses of the potentially liquefiable layers decrease and as the thicknesses of the nonliquefiable layers increase. Considering the largest ground acceleration used for this study (0.33g), it appears that surface manifestation of liquefaction (i.e., sand boils or ground cracking due to lurching) is probably not a significant concern.

The estimation of ground surface settlement due to liquefaction has been addressed by Tokimatsu and Seed (1987). The cyclic stress ratios computed in this study ranged from less than 0.10 to over 0.30. Analysis of the Ventura field and laboratory data suggests that volumetric strains of about 2 to 3 percent of the liquefiable layer thickness could result if liquefaction were to occur. The sum of all the individual liquefiable layer thickness of 5.5 feet was identified. Assuming this maximum cumulative liquefiable layer thickness, ground surface settlements of about 1-1/3 to about 2 inches could result from soil liquefaction. The magnitude of the resulting differential settlement is difficult to estimate, but it may be on the order of about one-half the total settlement.

Soil flow due to liquefaction has been observed on slopes as flat as one percent or less. However, no continuous or laterally unsupported liquefiable soil layers were identified in the study area and therefore soil flow deformations do not appear to be a significant concern.

In summary, the potential for liquefaction was not considered a particularly significant problem. The Seismic Risk Model inputs were adjusted accordingly (as described in chapter 7). These findings have several important ramifications including:

(1) the extent to which building failures may be accentuated due to liquefaction potential was determined to be a relatively minor problem;

(2) **if a mandatory strengthening program is ultimately adopted, soil conditions during future earthquake events would tend not to enhance the damage inflicted on the building stock; and**

(3) **the number of radical building failures, injuries, and fatalities expected to occur during a strong earthquake on a local fault would not tend to be increased due to liquefaction.**

Soil Amplification

As discussed above, soft soils (especially cohesive soils), have been recognized as a source of amplification for ground motions as the earthquake waves propagate upward through the soft soil column. Amplification problems created serious intensification of unreinforced building damage during the Loma Prieta quake and therefore, given the location of downtown Ventura in relation to the Ventura River, problems related to amplification were considered potentially significant.

In response to this concern, the Staal, Gardner, and Dunne study addressed amplification potential. **Based on field testing and laboratory data, the consultants documented that the downtown study area is underlain by soft cohesive soils that could cause ground motion amplification. It appears bedrock ground motions could be amplified by a factor of about 1-1/2 to 2 depending on the amplitude of the bedrock acceleration value. These amplification factors were taken into account in the revised results obtained from the Seismic Risk Model (see chapter 7).**

6.9 A Summary of Relevant Earthquake Events in Ventura and The Relevance of Seismic History for Earthquake Prediction

Several individuals commenting on the Draft EIR requested a review of the history of fault movements in Ventura. Summarizing this history of these movements is of limited utility in predicting future events and such an undertaking is subject to a number of limitations. The most significant limitation is that the length of time that unreinforced buildings have existed in Ventura in relation to geologic time is miniscule and therefore **historic data, when geologic processes are the subject of study, have only weak relevance as predictors.** A second limitation is that Richter Magnitude data from fault significant movements prior to the early 1900s are virtually unavailable and can only be extrapolated. The technological absence of seismic movement measuring devices during much of the time when unreinforced buildings have existed in Ventura is an obvious limitation which needs to be taken into account in reviewing the accuracy and completeness of available historic data. The ground accelerations from earthquakes that have affected the downtown part of Ventura prior to 1910 cannot be determined accurately based on Richter magnitudes. The Modified Mercali Index (MMI), an ordinal scale based on qualitative judgements (but limited to local ground acceleration estimates), is the more proper scale for assessing the strength of historic earthquakes which occurred prior to the development of the Richter scale but no systematic MMI scale review of earthquakes affecting Ventura is available.

In comments on the Draft EIR, some individuals commented that the historic record of earthquakes in Ventura could provide important information about how the City's unreinforced building stock would perform in the future. The underlying question that these commentors wanted addressed was: have prior earthquake experiences affected Ventura as significantly as the predicted level of damage, injury, and fatality calculated by the Seismic Risk Model? Put even more simply, these commentors asserted that since the unreinforced buildings performed adequately during prior earthquakes in Ventura, why should any reinforcement be required at this time?

These questions are actually not relevant for this reason: the last comparable movement to what is predicted (in the Seismic Risk Model) on the San Andreas occurred in 1852 prior to the construction of most of the unreinforced buildings in downtown Ventura. Based on anecdotal data contained in historic references, a number of adobes in Santa Barbara and Ventura were damaged in this earthquake but, other than this anecdotal information from historic accounts, little else can be stated with certainty about the history of damage, death, and injury associated with strong movements on the San Andreas. The recurrence interval for strong movements along the southern portion of the San Andreas is about 100 years (a rough estimate) and the probability for a movement to occur in the near future which is comparable to the 1852 quake is 30% in the next 30 years, a high probability in earthquake prediction modelling.

The probability of occurrence for a moderately strong to severe quake along other less active faults in the region is lower than the event projected for the San Andreas and the recurrence interval for significant movement on these faults is rather lengthy. Comparable historic data cannot be obtained since prior movements on the Pitas Point-Ventura fault have not occurred historically.

Several hundred years, in geologic time, is obviously a very brief time span. That destructive earthquakes have not yet come to pass in downtown Ventura is not a cogent argument for declining consideration of a strengthening standard. Prior to the Loma Prieta, exactly the same logic was applied to buildings in the Watsonville-Santa Cruz area which now, since the Loma Prieta quake, have been demolished.

Earthquake Sources Used in the Seismic Risk Model

For the simulation of earthquake damage in Ventura, two seismic sources were included in the Seismic Risk Model. The first source is the San Andreas fault system, Central and South segments. The total segment length is 536 kilometers, maximum magnitude is 8.0 for the central segment and 7.75 for the southern segment [see references 7 and 8 at the conclusion of the Response to Comments section for complete documentation of these values]. The annual slip on this fault is between 35 to 67 centimeters. There have been 255 events on this fault in the past 187 years, the 1897 earthquake being the largest with magnitude 7.9 [Reference 9, Response to Comments], and 8.25 [Reference 10, Response to Comments]. A complete list of earthquakes which have occurred on this fault during recorded history and the measured earthquake magnitudes for Ventura are provided in the Technical Apppendix to the EIR.

The second source considered in the model is the Pitas Point-Ventura fault which is an east-west trending reverse fault. The length is at least 50 km. The slip rate is about 2.4 centimeters per year. Most small historic earthquakes associated with this fault system have occurred towards the eastern end of the fault. Movement of the fault has apparently formed a scarp in Holocene-age sediments. There have been 119 historic earthquake events recorded near the fault, the 1941 Santa Barbara earthquake being the largest with a magnitude of 6.0 [References 9, 11 in the Response to Comments section provide complete documentation of prior seismic measurements on this fault]. The consultants have assigned a maximum magnitude of 7.25 to this fault in conformance with the CDMG database [References 7, 8 in Response to Comments]. A complete list of earthquakes which have occurred on this fault during recorded history and the measured earthquake magnitudes for Ventura are provided in the Technical Apppendix to the EIR. Both the Pitas Point and San Andreas fault sources are considered active and they are both included in State of California Alquist-Priolo Special Studies Zones.

There have been no events documented with a Richter Magnitude greater than 6.0 associated with the Ventura fault. However, a maximum magnitude of 7.25 was compiled in the CDMG database.

In the ERTEC study, a magnitude of 7.5 was assigned, apparently to be slightly conservative. Using standard formulas for thrust faults and a 50 km length:

$$\log 10\,(L) = 0.497M - 1.96$$

$$M = \frac{(\log 10(L)\ 1.96)}{0.497}$$

Using the formula for reverse slip faults:

$$M = 4.145 + 0.717 \times \ln(L) = 6.95.$$

Therefore, using a maximum credible magnitude of 7.25 for the Pitas Point fault is reasonable; this value was used in the simulation of future building damage for Ventura.

Several commentors questioned the seismicity of the San Andreas fault and inquired about the distance from Ventura to the San Andreas. The distance from Ventura to the 1857 rupture zone (the only historic quake comparable to future events predicted by the Seismic Risk Model) is about 60 km (or 40 miles). In the USGS Open File Report 88-398, the section of San Andreas from Carrizo to Mojave is described as having a 10-30% chance of generating an earthquake of magnitude 7.5 to 8.0 in the next thirty years. In the ERTEC study, a distance of 65 km was used to determine the seismicity of Ventura.

Because of increased public interest and concern about potential loss from future earthquakes in California, the National Earthquake Prediction Evaluation Council recommended that the probability of occurrence of large (magnitude 7 or greater) earthquakes in California be evaluated. USGS Open File Report 88-398 is the result of the study on California Earthquake Probabilities. In this study, the evaluations were based on a probability model that assumes an increase of probability with elapsed time since the previous major earthquake on the fault segment. Based on this study, the San Andreas fault systems in segments Carrizo and Mojave could generate an earthquake of Magnitude 7.5-8.0 with a 10-30% chance in the next 30 years. Stanford University (Reference 14 in the Response to Comments section), based on the historical records of 255 events, has predicted that there is a 22% chance that there will be an earthquake greater than 7.75 in the same time period. This conclusion is similar to USGS Open File Report 82-1033 (Reference 13 in the Response to Comments). In CDMG compiled data (References 7, 8 in the Response to Comments), the maximum magnitude for this segment is 7.75. The actual model used for the Ventura study has two segments of the San Andreas Section with maximum magnitudes 8.0 and 7.75 respectively. The computer maximization routine picked the segment with Magnitude 8.0. Hence the actual scenario used in calculations was a Magnitude 8.0 on the San Andreas.

The USGS study does not include the Ventura fault. In 1985, ERTEC did a Seismic Hazard Analysis of Ventura which, based on historic data, predicted that the City will experience 0.28g ground motion with a return period of 600 years. This report also concluded that the Magnitude 7 event on the Pitas Point-Ventura fault will produce 0.7g ground motion in Ventura. It can be inferred that such an event would have a return period of at least several thousand years. Using Stanford research results based on historical records, the return period for a Magnitude 7.0 event is about 5,000 years. It is generally conceded that there has been no large movement recorded in the very brief recorded history of the Ventura fault. The 1% probability in 30 years was used to indicate that the seismicity is relatively low for the Ventura fault.

In summary, the historic record of earthquakes which have occurred in Ventura is very brief, so brief in fact, that even the last recorded major movement along the San Andreas occurred prior to the construction of the unreinforced masonry buildings in Ventura. Given the calculated recurrence interval for an event on the Pitas Point-Ventura fault, it is probable that the prior significant movement on this fault (comparable to the maximum credible earthquake) occurred in prehistoric time. Given the slow manifestation of geologic phenomenon, historic experiences, when used to predict future conditions, do not provide accurate predictions of risk. Despite the apparent limitations of historic data, a complete history of

fault movements along both fault sources was compiled and is included in the EIR Technical Appendix. **What the history of both of these faults indicates is that both faults are active, slipping, and capable of substantially greater movement than what has been recorded historically.**

Tables 6-3, 6-4 and 6-5 summarize information about a selection of historic earthquakes on both faults (including data from both the southern and central San Andreas faults). The information provided in these summary tables was derived from a complete list of fault movements which are included in the EIR Technical Appendix (Rutherford and Chekene Seismic Risk Model Appendix). Inspection of these tables indicates that in addition to the 1852 strong earthquake on the San Andreas, all three fault expressions have generated events with substantial Richter Magnitudes. Pitas Point movements have ranged from Magnitudes of about 3.5 to 6.2 and San Andreas movements have ranged from about 4.0 to more than 8. A number of less significant quakes have occurred on all three faults as indicated in the Technical Appendix tables. Correlating these prior movements with reports of damage and injury can only be done through archival research which was beyond the scope of work for the EIR. However, based on information contained in **Table 6-2** and **Figure 6-2**, the strongest of these prior earthquakes would have induced parapet and wall tie failures, and potentially some out of plane failure. The cumulative damage from these earthquakes is evident in some of the older examples of unreinforced buildings in the City (e.g., the Peirano Store, the Wilson Studio). The strength of prior quakes have been sufficient to generate deaths or injuries, primarily from parapet failures. The extent of injury or death resulting from prior quakes is unknown and can only be reconstructed through archival research. Specifically, the Pitas Point earthquake of 1941 and the San Andreas quake of 1890 both could have resulted in moderate damage in the City. Movements on other faults also have contributed to the observable cumulative damage to buildings in the City.

In summary, a review of these tables warrants the following conclusion: both faults are capable and in a state of movement; they are active and can inflict considerable damage. The following chapter describes in detail the level of destruction, injury, and death these quakes are capable of generating in Ventura.

TABLE 6-3

HISTORIC MOVEMENTS ON THE
PITAS POINT - VENTURA FAULT

Date	Time of Occurrence	Estimated or Measured Richter Magnitude
10/02/1984	09.64	3.61 + - 0.17
08/13/1978	22.91	5.54 + - 0.17
07/14/1958	05.43	4.60 + - 0.31
09/08/1941	03.21	4.50 + - 0.36
07/01/1941	08.32	4.00 + - 0.36
07/01/1941	07.85	5.94 + - 0.30
06/26/1933	06.46	4.18 + - 0.28
06/26/1933	06.43	4.18 + - 0.28
03/07/1933	17.22	3.50 + - 0.36
05/01/1904	18.08	3.70 + - 0.20

Note: Time values are in minutes and hundreths of an hour

TABLE 6-4

HISTORIC MOVEMENTS ON THE
SAN ANDREAS CENTRAL SEGMENT

Date	Time of Occurrence	Estimated or Measured Richter Magnitude
07/18/1983	04.61	3.57 + - 0.10
02/01/1974	01.62	4.10 + - 0.36
03/05/1969	13.90	4.76 + - 0.27
02/18/1967	18.82	4.68 + - 0.27
02/10/1954	23.98	4.30 + - 0.28
08/23/1952	10.15	4.89 + - 0.31
02/24/1946	06.13	4.23 + - 0.31
02/23/1939	09.31	4.50 + - 0.36
02/09/1890	12.10	6.80 + - 0.30
01/09/1857	16.00	7.90 + - 0.30

Note: Time values are in minutes and hundredths of an hour

TABLE 6-5

HISTORIC MOVEMENTS ON THE
SAN ANDREAS SOUTHERN SEGMENT

Date	Time of Occurrence	Estimated or Measured Richter Magnitude
08/08/1976	19.63	4.00 + - 0.23
02/18/1971	04.59	4.07 + - 0.25
01/23/1969	23.02	4.68 + - 0.21
05/28/1961	13.00	4.45 + - 0.31
09/02/1956	02.78	4.20 + - 0.36
09/01/1956	05.96	4.00 + - 0.36
02/11/1948	03.49	4.60 + - 0.31
10/31/1943	13.20	4.50 + - 0.36
03/04/1937	16.07	4.00 + - 0.36
09/30/1916	04.42	3.70 + - 0.20

Note: Time values are in minutes and hundreths of an hour

CHAPTER 7

PREDICTIONS REGARDING THE PERFORMANCE OF VENTURA'S UNREINFORCED MASONRY BUILDINGS: THE SEISMIC RISK MODEL

Revisions to the Final EIR in Response to Comments on the Draft

In response to comments on the Draft EIR, a number of revisions were made in this chapter. The City of Ventura retained Staal, Gardner, and Dunne to perform a field assessment of liquefaction potential within the downtown study area; this assessment also addressed problems related to soil amplification potential. On the basis of the results of this study (summarized in Chapter 6 section 6.8), the Seismic Risk Model results presented in this section were modified to reflect the realistic potential for liquefaction and amplification related problems. As a result of this adjustment and other minor changes in the model, the earthquake simulation results were modified. In addition, to simplify comprehension of the model results, new summary tables were prepared which described the specific life safety and building damage reduction improvements associated with each of the levels of strengthening being contemplated by the City. The revised model results made it possible to combine the two risk analyses performed in the Draft EIR (seismic events with and without liquefaction) into a single model run. In essence, the liquefaction/amplification potential in the City was sufficiently low that only one model output was necessary to describe the results of future earthquakes. The differences between a model run with and without the liquefaction potential factor included were insignificant. This was an encouraging result which has an important implication: if strengthening is performed on buildings in Ventura, the building damage that would result from a future earthquake (after strengthening) would not be seriously exacerbated by liquefaction/amplification problems.

In addition to these changes and revisions, at the conclusion of the chapter, a discussion has been added which puts into perspective the risk of death and injury from an earthquake compared to other common sources of death (illness, accidents, homicide, suicide, sports accidents, and natural disasters). This comparative analysis was requested by many of the individuals commenting on the Draft EIR. The results of this comparative risk analysis suggest that the risk of dying from an earthquake in Ventura are quite remote compared to other sources of risk common in the environment. This conclusion, however, must be tempered with an understanding that the risk analysis is skewed by annualizing the probability of death; because earthquakes are comparatively rare events, annual risks are low but in years when serious earthquakes occur, the death rate is about half the annual death rate from hurricanes and tornadoes. Finally, the concluding section of this risk analysis summarizes the available data about what types of buildings in the study area within downtown Ventura would generate the most injuries and deaths. Not surprisingly, given the absence of tilt-up structures and the low density of non-ductile concrete buildings in the City, unreinforced masonry buildings represent the single most important source of potential earthquake related deaths in Ventura.

7.1 Introduction and Problem Definition

This chapter of the EIR is designed to answer the following questions:

- **How many lives would be lost in the event of a moderate to strong earthquake if no upgrading is required?**
- **How many fatalities and injuries would occur and how extensive would building damage be if an earthquake occurs on either the San Andreas or Pitas Point-Ventura Faults?**
- **What life safety and building damage reduction improvements would result from implementing a Level I or Level II upgrade?**

- o **Would adoption of a program similar to the State Model Ordinance (a Level III upgrade) further enhance life safety and building damage reduction beyond the Level I or II options?**

- o **What degree of building damage reduction would be achieved with each of these alternatives?**

These questions have been answered through the use of a complex computer model developed by the San Francisco engineering firm Rutherford and Chekene. The model was originally developed to study the effects of various levels of strengthening on the inventory of over 3000 unreinforced structures in the City of San Francisco. The model has also been used to predict results of strengthening programs and earthquake effects for the Cities of Santa Monica and Oakland. Although the model represents a state-of-the-art simulation of earthquake damage and the reduction in damage that results from different levels of strengthening, the basic components of the model have been derived from commonly used engineering and seismic design practices developed over the past thirty years. The incorporation of these design, hazard analysis, and engineering principles into a computer model has increased the range and speed of earthquake hazard estimation. No unique, unusual, or unproven technologies or engineering methods have been developed for the simulation. In response to comments on the EIR, Rutherford and Chekene specifically responded to questions about the computer model in this manner:

"The computer model uses accepted seismic risk analysis and structural analysis methodologies to estimate seismic losses under different conditions. Similar methods have been used on single buildings without the convenience and speed of a computer for over twenty years. Other than combining several procedures into a single computer program, the model should not be considered as new technology. Although specific features pertaining to URM buildings were developed of the study of San Francisco buildings, the basic calculation steps and procedures are applicable statewide. These steps, and authorities for their acceptability, include:

1. Identification of seismic sources (U.S. Geological Survey [USGS]; California Divisions of Mines and Geology [CDMG]).

2. Change of ground motion with distance from source (attenuation) (USGS).

3. Estimation of damage to buildings from different ground motions (References 1, 4, 5 in the Comments and Responses section).

4. Seismic risk calculations (Reference 3 in the Comments and Responses section) (Response to Comments submitted by Thomas Wood, 1991)."

Another question raised by the public about the model concerned the accuracy of the results and potential error in estimating building damage and life loss. Like all models, the simulation results described in this chapter are subject to estimation error. On this topic, Rutherford and Chekene provided the following information:

"It is recognized that there is a wide variation in performance of structures in earthquakes. However, as the number of buildings considered is increased, the variation in overall results decreases. The variation in estimated damage for any given building may be as much as 300%. The reduction in variation is roughly proportional to the square root of the number in the sample; for about 150 buildings, this variation should therefore be reduced to about plus or minus 25%. This magnitude of variation would not void use of the methodology. Systematic errors (errors in establishment of calculation parameters), on the other hand, would affect all alternatives similarly and would therefore not affect comparisons. To minimize the chance of systematic errors, overall results of various scenarios have been checked against comparative historical events for the San Francisco, Ventura, and Santa Monica studies and found to be reasonable. Therefore, for the stated purposes of establishing the overall risk level and for comparing alternative actions, the SRM

methodology is acceptable and appropriate (Response to Comments submitted by Thomas Wood, 1991)." Therefore, even under conditions where the model results departed from the reality of future conditions exceptionally, an increase or decrease of 25% in the results would not substantially change the conclusions in the following analysis. Also, the potential that all results are uniformly or directionally in error to this degree is very remote.

The Seismic Risk Model presented in this chapter is a complex prediction of the interaction between seismic events, building responses, injury an death estimates, and socio-economic loss predictions. The following discussion has been simplified to the degree feasible given the complexity of the model and the need to understand a substantial number of engineering principals in order to comprehend how the predictions were obtained. This chapter has been extracted from the complete **Rutherford & Chekene** technical study prepared for this EIR. A copy of this technical report is included in the Technical Appendix of the EIR. To fully understand the language and references in this chapter, it is probably necessary to read both chapters 4 and 5 of the document first.

A summary and interpretation of the model results is provided in sections 7.4 and 7.5 of this chapter. The non-technical rendering of the model results is provided for members of the public and for the decision-makers who want to know only what conclusions were drawn from the analysis (rather than how these conclusions were derived). Considerably more information is contained in this chapter than is summarized directly in the conclusion of the chapter. However, the purpose of this chapter is merely to answer the policy questions posed above and the concluding sections provide responses to these questions.

Following this chapter, comparative data from cities with unreinforced buildings that were damaged during the recent Loma Prieta quake are provided as a cross check on the model results. Taken together, these two chapters provide both predictive (statistical) and comparative (empirical) data relevant to the questions posed above.

7.2 The Seismic Risk Model

Building damage and life loss was estimated using a computerized Seismic Risk Model (SRM) that considers both shaking intensity and the damage characteristics associated with each building in the Ventura inventory (see the Project Description for buildings included in the inventory). A copy of all data input into the model is provided in the Technical Appendix provided by Rutherford and Chekene. Local shaking intensity was estimated using calculated fault distances, standard attenuation relationships, and site soil conditions. Peak Ground Acceleration (PGA) was initially calculated and then converted to projected Modified Mercalli Intensities (MMI). PGA and MMI are used concurrently to identify shaking intensities for the estimation of damage. The effective PGA normally used for code mapping and dynamic analysis is generally taken as three-quarters of these values. Descriptions of the Modified Mercalli Intensity Scale and its relation to the Richter Scale are discussed briefly in Chapter 6. Given the location and characteristics of each fault source included in the model, local shaking intensities were estimated not only for specific events, but also on a probabilistic basis for all events. Both the estimation of intensities for any specific event and the expected damage these events might generate can have large statistical variations.

The extent to which buildings might be damaged during a typical seismic event was estimated considering the building characteristics and other specific attributes contained in the database. The accumulated damage over several periods of time was estimated by combining the probabilities of occurrence of each shaking intensity; a smoothed curve relating intensity and damage was developed. In this study, probabilistic results have been reported on an annual expected loss basis. This does not mean that such losses are expected annually, but rather that losses would approximately average the annual expected loss over an extended period of time. Since a major earthquake could occur at any time and skew short-term accumulated losses, annual loss results can be misleading if interpreted literally. **However, when various alternative actions are to be analyzed, use of probable annualized results is the most valid method of comparison.**

For the Ventura model, relationships were developed between building damage and predicted casualties as well as building damage and loss of building use by owners, occupants, and tenants. Casualties were estimated considering both building occupants and sidewalk pedestrians. Obviously, the population at risk varies a great deal with time of day. An algorithm for estimating loss of building use was also developed, based primarily on experiences in the Loma Prieta earthquake which considers structural evaluation delays, reasonable damage repair rates, and critical loss levels, where demolition is likely.

This model procedure has also been utilized on a study of unreinforced buildings in San Francisco, prepared for the San Francisco Department of City Planning (completed in April 1990) and a similar model program has recently has been used to predict building damage for the City of Santa Monica. The model is also now being modified to simulate future earthquake related conditions in Oakland. Much of the methodology used for Ventura was developed while completing the San Francisco study. Every attempt has been made to keep the Ventura work consistent with both the San Francisco, Santa Monica, and Oakland studies so that differences in damage estimates would reflect only differences in seismicity and building type between these three cities. To the extent feasible, comparable information from all three cities has been used in the impact evaluation (particularly for cost-benefit questions).

Buildings in San Francisco were separated into fifteen Prototypes, based on the analysis of the database of approximately 2,000 buildings. Relationships between damage and shaking intensity were developed for each prototype and for several strengthening conditions. Strengthening Alternative 1 for the San Francisco model run consisted of wall-floor ties and out-of-place wall strengthening which is very similar to but more extensive than the Ventura **Level I** option. Alternative 2 for San Francisco was based on the Division 88 RGA procedure used in Los Angeles, a program roughly comparable with the Ventura **Level III** proposal. San Francisco Alternative 3 was a "conventional" strengthening procedure traditionally used in San Francisco for occupancy conversions (similar to the 1973 UBC with certain archaic material made acceptable). Similar hierarchically arranged alternatives (described below) were used in the Ventura model.

Data Base and Damage Intensity Relationships

The unreinforced buildings included in the Ventura inventory used for the model were compiled from two data sources: the 1985 Earthquake Hazard Building Survey, performed by the City and John Kariotis, and data contained on Sanborn Maps which were collected specifically for the modelling program. From these two data sources, the following site and building attributes were selected for the analysis:

- **Geographic Coordinates (in relation to both major and minor faults)**
- **Building Use**
- **External Wall Material**
- **Total Building Area**
- **Number of Stories**
- **Building Height**
- **Adjacencies (characteristics of adjacent buildings, lots, or streets)**
- **Exposure (length and type of open frontage)**
- **Parapet Height**

- o **Amplification (of ground shaking)**
- o **Fault Rupture Risk**
- o **Liquefaction Potential.**

Based upon distinctive structural characteristics in the building inventory, the buildings included in the model were divided into six classes:

Class 1: **Small one-story buildings, no-tile walls, non-residential, area less than 2000 sq. ft.;**

Class 2: **All residential buildings, no-tile walls;**

Class 3: **Large, one-story commercial or office buildings, area greater than 2000 sq. ft.;**

Class 4: **Multi-story commercial or office buildings.**

Class 5: **Assembly or industrial buildings, excluding small, one-story buildings.**

Class 6: **All tile wall buildings.**

Each of these building prototypes has distinct characteristics. The dominant attributes of each building type are summarized and illustrated briefly below. These illustrations are designed to roughly describe each prototype configuration and are not intended to represent actual structures in the Ventura inventory.

Strengthening Levels Assessed by the Model

The projected results of the existing conditions (unstrengthened case) and three alternative strengthening levels were included in the modelling program. Two of the three strengthening options were based on the previously proposed Level I and Level II upgrades proposed by the City. The Level III option used in the model is the 1990 (most recent version) of the State Model Ordinance. As explained in Chapter 4, due to the impractically high costs and disruptions associated with a Level IV upgrade, this option was not studied in the model program.

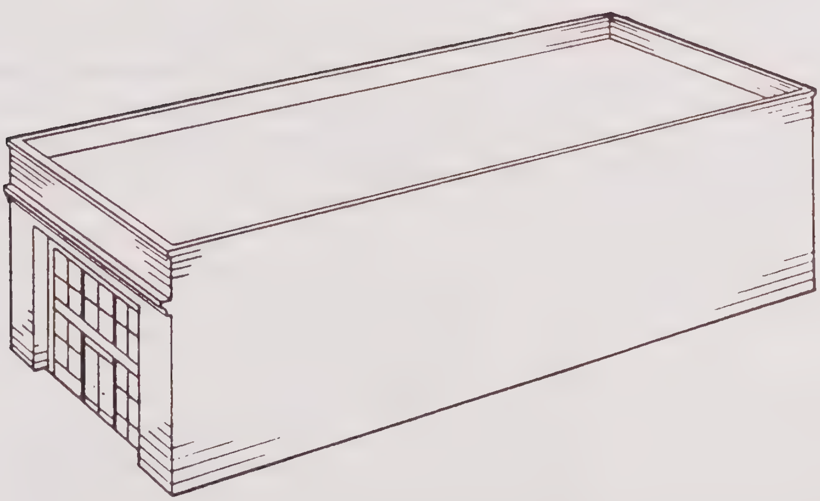
In brief, the **Level I** upgrade requires tension and shear anchorage for walls at floor and roof levels and bracing or removal of parapets. Seismic force levels were modelled based on a Zone 3 seismicity level.

The **Level II** option would require more complete upgrading of seismic systems including all Level I requirements, plus diaphragms and shear walls. Seismic force levels were modelled using Zone 3 seismicity, except out-of-plane wall stability requirements which were roughly equivalent to commonly proposed engineering solutions for Zone 2 seismicity. As discussed in Chapter 5, this reduction was based on the diminished seismicity of the Ventura area estimated by ERTEC (and others).

The set of provisions described as **Level III** were the result of considerable debate and compromise among committees of structural engineers in California (see the EIR Technical Appendix for a review of these disputed technical issues). Although primarily produced by the Structural Engineers Association of California, the California Seismic Safety Commission and CALBO also have partially sponsored this **Level III** approach to upgrading. As described in the EIR Technical Appendix, these provisions offer alternate procedures, one following a conventional code methodology and one following the Los Angeles RGA. The procedure is applicable to Seismic Zones 2, 3 and 4. Since Ventura is in Zone 4 according to the UBC, Zone 4 provisions are assumed for the **Level III** predictions in the model. The Technical Appendix includes comparative data relating the selected levels of upgrading compared to upgrading models included in the San Francisco modelling program.

Prototype 1: Small Area One Story Buildings

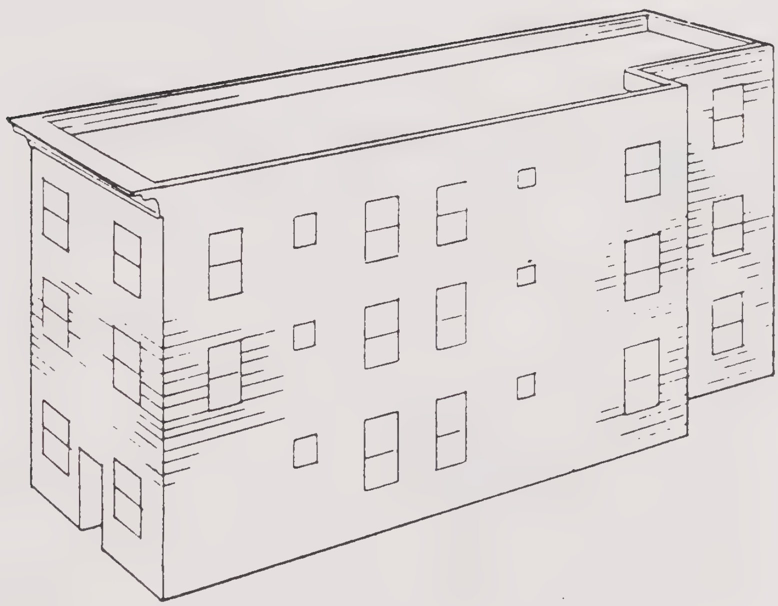
Prototype 1 is one of the most common building types in the Ventura inventory. This type of structure is a small, nonassembly, one story building with a total building area of less than about 2,000 square feet. Most of these buildings are either commercial stores, garages or industrial buildings. As a result, they generally have fewer internal partitions. The majority of these buildings are located in the Downtown Community and in the Avenues. Some of these buildings have soft stories; more specifically, store fronts have large window and door penetrations in the masonry wall, thereby reducing the wall's ability to resist lateral forces. The median building footprint is approximately 2,000 square feet. The majority are rectangular buildings, with no reentrant corners, and the prototype has two prominent diaphragm ratios -- those less than two and those greater than three. This indicates that many buildings are approximately 40 by 60 feet and many are approximately 30 by 90 feet. Many of the buildings have a single story height of 16 or more feet.



Small Area, One-Story Buildings

Prototype 2: Two and Three Story Small Area and Residential Buildings

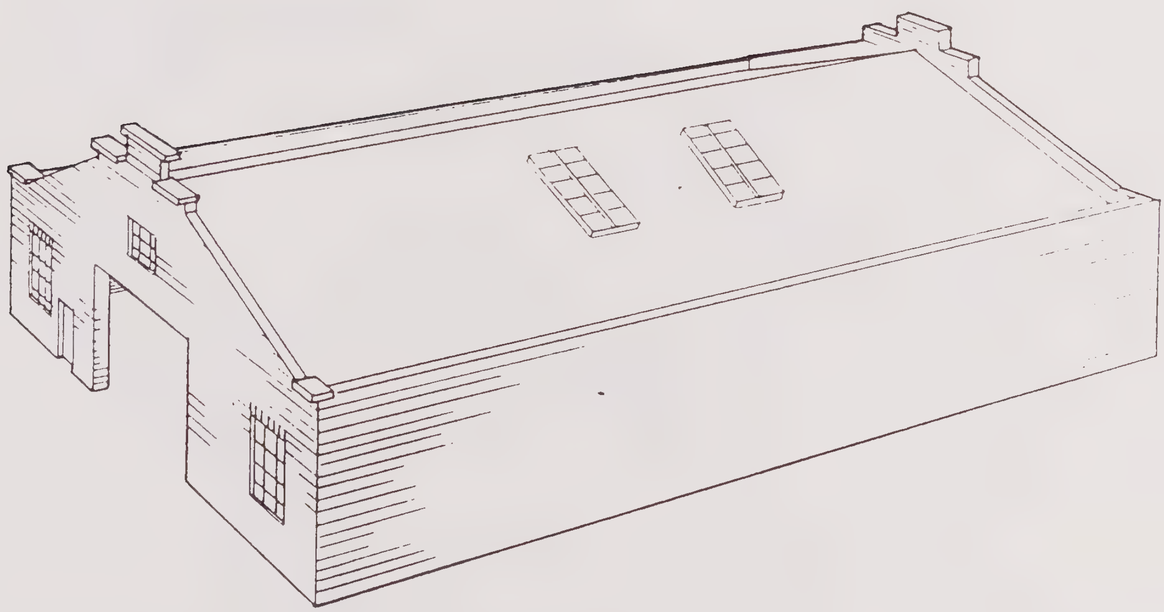
Prototype 2 includes nonirregular, two- and three-story residential buildings with average footprint areas of less than 2,500 square feet. These small apartments, hotels, and other dwellings will have many internal partitions used to separate rooms. Diaphragm ratios vary widely, but a ratio between 2.5 and 3 is common, with plan dimensions of about 25 by 65. At approximately 13 feet, the average story heights for Type 2 buildings are less than many nonresidential buildings.



2- and 3-Story, Small Area, Residential Buildings

Prototype 3: Large Area One Story Buildings

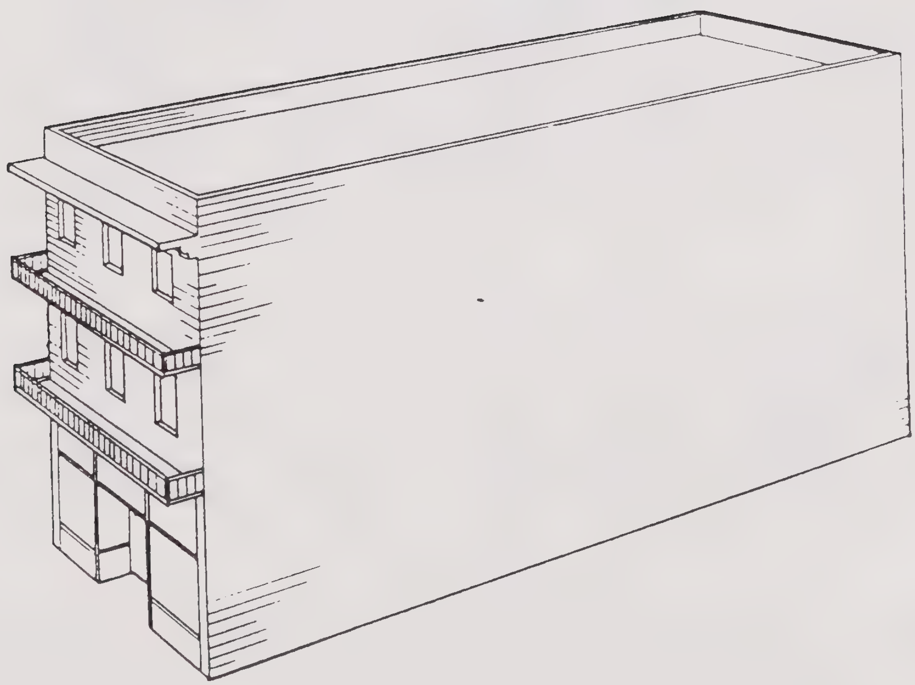
This building type includes one-story, nonassembly buildings with total building areas of 4,000 or more square feet. Nearly all of these buildings are commercial stores, garages or industrial buildings. Although building area is the primary distinction between Prototypes 1 and 3, there are other differences. For Type 3 buildings, there is greater variety in building plan shapes and the diaphragm ratios are smaller. Typical buildings have a diaphragm ratio of two, with a building area of 10,000 square feet, and with plan dimensions of approximately 70 by 140 feet. Prototype 3 buildings are generally taller and they have fewer soft stories.



Large Area, One-Story Buildings

Prototype 4: Two and Three Story Small Area Office and Commercial Buildings

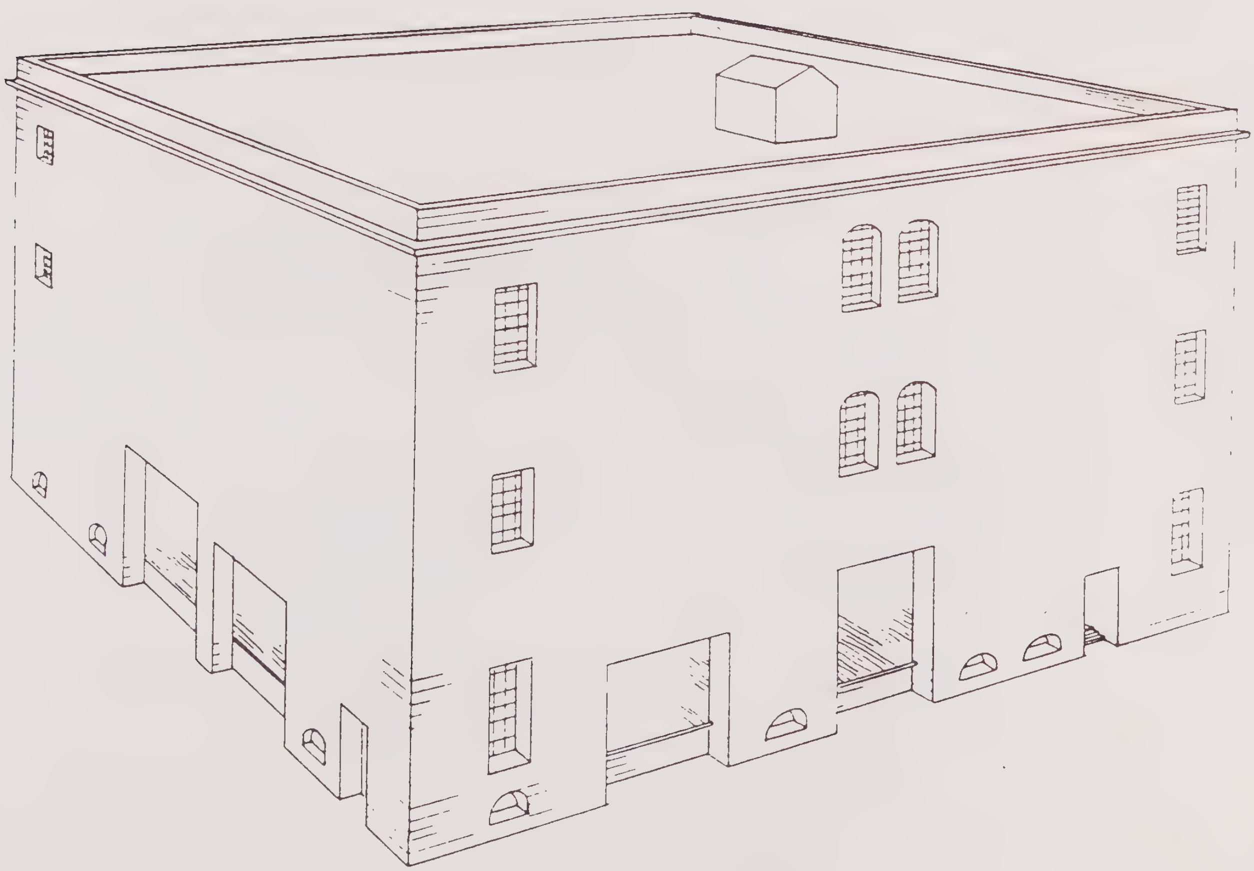
This class of buildings is comprised of nonirregular two- and three-story buildings with average footprint areas less than 4,000 square feet. While a small percentage of these buildings may have some residences in part of the structure, Prototype 4 buildings primarily serve office and commercial functions. Because they are office and commercial buildings, they generally will be few internal partitions that actually link diaphragms together. The mean footprint area is less than 2,200 square feet and story heights usually fall in the 12-16 feet category. Diaphragm ratios fall into two major categories - less than two and those greater than three. Consequently, plan dimensions of 35 by 60 feet and 30 by 100 feet are common.



2- and 3-Story, Small Area,
Office and Commercial Buildings

Prototype 5: Large Area Industrial Buildings

Prototype 5 is comprised of nonirregular, retail and industrial buildings, warehouses and garages with an average footprint area of 5,000 or more square feet and a height of over one story. The majority are located in the Downtown and Avenues areas. Some buildings are two or three stories. With a typical footprint area of 10,000 square feet, plan dimensions of 70 by 140 feet are common. Many of these structures are also nearly square with plan dimensions of 100 by 100 feet. A small percentage of this type of building has soft stories.



Large Area, Industrial Buildings

Seismic Conditions Included in the Model

Ventura is located in a seismically active region. The Pitas-Point-Ventura fault is an east-west trending reverse fault which is within 1 mile of most unreinforced buildings in the City. **This fault is capable of generating an event of Richter Magnitude 7.0, resulting in the worst earthquake damage scenario for the City.** However, the probability of this kind of event is very small, less than a 1% chance in the next 30 years. **The most probable threat for Ventura is correlated with movement on the San Andreas fault system which is located, about 40 miles away.** There is a chance of an earthquake occurrence of Magnitude 7.75 in the next 30 years. Due to these circumstances, seismic risk analysis was conducted using the following seismic risk conditions:

1. **Annual Risk (based on probability considering all faults).**

2. **Worst case -- Pitas Point Ventura fault with magnitude 7.00 during the day.**

3. **Probable event -- San Andreas fault with magnitude 8.0 during the day.**

4. **Probable event -- San Andreas fault with magnitude 8.0 at night.**

The **Annual Risk** factor requires some explanation. This result predicts the probability of damage taking into account all known quakes and their probability of occurring in any given single year. The results of the analysis are presented both as an annualized risk and an annual risk multiplied by a 30 year interval. Use of the 30 year interval was justified because this interval is commonly used (by the USGS and other seismic monitoring agencies) as the basis for predicting the probability of an earthquake occurring on any single fault. A 50 year interval was used in the Draft EIR which produced some confusion. Therefore, the results of the model for the annualized probability estimate differ in the Draft and Final documents. The change in results was directional; all predicted injuries, deaths, and building damage factors were reduced by standardizing the cumulative annual loss projections over a 30 rather than 50 year period.

Damage Modification Factors

One of the advantages of the calculation methodology used in the Seismic Risk Model is the ability to consider the specific attributes of each site and building through the use of a weighted average to achieve a better representation of actual conditions. Many attributes were considered for use, but little data exists that can be used to rationalize quantitative effects on damage. The damage modification factors used (described below), are not believed to be qualitatively controversial. The size of modifications to the model were based on the engineering consultants judgement rather than explicit on mathematical criteria.

(1) Site Soil Modification

The most obvious site-specific characteristic to account for in Ventura is soil condition. The amplification of shaking due to soil conditions is a well documented phenomenon; the significance of soil amplification was clearly demonstrated during the Loma Prieta Earthquake. The soils data available in the data base were originally obtained from the Ventura Comprehensive Plan Safety Element Technical Appendix. The City also retained Staal, Gardner, and Dunne to perform specific soil engineering studies in the downtown area to determine the scope and significance of both liquefaction and amplification problems. The findings contained in this report were summarized in Chapter 5; portions of the Final Report are included in the EIR Technical Appendix.

Soil conditions capable of modifying the intensity of damage to structures were classified into four categories following the amplification typology in the Seismic Safety Element: 1- long period-strong shaking; 2- long period-slight to moderate shaking; 3- short period-strong shaking; and 4- short period-slight to moderate shaking. According to the description of these four soil types, type 1 soil is thick

unconsolidated alluvium with high water table level. An increase in one step of MMI was used in the model analysis to account for the presence of this condition. However, for the scenario of a local Ventura earthquake (opposed to a San Andreas event), due to the proximity of rupture potential, ground motion would be dominated by high frequency and the MMI for this type of event was already set at about MMI IX. Thus, no increase of MMI was applied to this case. Type 4 soil generally occurs in hillside areas underlain by soft sedimentary bedrock. Past earthquake information indicates that building damage would be slight in areas underlain by these soils. Thus, a decrease in one step of MMI was used in the analysis to account for this condition. Intensity was not modified for Types 2 and 3. In summary, soil amplification conditions were modified as follows:

Soil Type	Modification to MMI
1	+1
2	0
3	0
4	-1

The results of the site specific study performed by Staal, Gardner, and Dunne did not result in revisions to these soil modification factors. The model values originally included represented close approximations of the field results.

(2) Liquefaction Modification

In cohesionless soil under the water table, intensive ground shaking will result in liquefaction. When the ground has liquefied, no matter how the building has withstood the shaking, the building will suffer significant loss. In the Ventura Safety Element Technical Appendix, the City floodplain next to the Ventura River is divided into three zones with various prediction values for liquefaction potential: high, moderate, and no hazard. In the model analysis performed for the Draft EIR, the consultants assumed that only when local intensity is greater than VI or VII depending on soil, liquefaction would be triggered with a severity that linearly increased with the ground shaking intensity up to intensity IX.

For high potential liquefaction areas, damage predictions for the Draft EIR were revised as follows:

Intensity	Increase in Damage Ratio
I < VI	0
VI u I < IX	[(I-6)/3] x 20%
I > IX	20%

For moderate potential liquefaction areas:

Intensity	Increase in Damage Ratio
I VII	0
VII I < IX	[(I-7)/2] x 10%
I > IX	10%

The significance of liquefaction potential as an influence on the model results was very evident and therefore the City undertook the field study of local soil conditions. The City had a legitimate concern that the potential for liquefaction damage to occur as predicted by the model could have overestimated damage considerably and for this reason the field study was completed. Based on the results of this study (Staal, Gardner, and Dunne, April 1991), it was determined that the liquefaction potential factors included in the City's Comprehensive Plan Update EIR overestimated the significance of the problem. The study concluded that (1) liquefaction and amplification potential was less extensive than previously thought and (2)

liquefaction would occur only in confined layers that would not cause significant surface effects. Based on these results, the liquefaction modification was not used in the damage and casualty estimation and the version of the results in the Draft EIR that included the referenced liquefaction factors summarized above were deleted from the results.

(3) Fault Rupture Modification

Fault rupture could affect buildings only if a movement occurs along the Ventura Fault. The consultants assumed that a quarter of MMI intensity step would be added to those buildings in Alquist-Priolo zone area (based on information in the Ventura County Seismic Safety Element). Although fault rupture under a building will not necessarily increase the shaking, this increase in apparent intensity yields an appropriate average increase in damage for these buildings.

(4) Modifications to Average Damage Considering Building Attributes

Modifications were made to average damage relationships for each class considering three building attributes: story height, adjacencies, and parapet presence, absence, and/or dimensions. The database of damage from the Loma Prieta Earthquake showed a clear pattern of increased damage in buildings with larger story heights. For buildings with average story heights equal to or greater than 16 feet, damage was increased equivalent to an increase in MMI of .25 intensity steps. Presuming that increased damage was primarily due to out-of-plane failures and that Level II and III retrofit alternatives would mitigate this problem, this modification was only made in calculations for the unstrengthened condition and Level I.

Detailed adjacency information was collected as a part of the data collection effort undertaken at the start of this study. Using these data points, it was possible to determine whether spaces adjacent to a given building were open or occupied by a building with a party wall or separate wall, whether the adjacent building was reinforced, and whether the adjacent structure is taller or shorter than the building under consideration. Buildings with party walls performed poorly in the Loma Prieta Quake, especially when the heights of two buildings were different, resulting in out-of-plane failures. Many instances of pounding-type damage have been recorded in earthquakes, particularly when adjacent buildings are of variable heights and create an abrupt change in stiffness. A corollary to this condition is the case of a building restrained by equal or taller buildings on both sides. Although minor pounding damage may occur, the damage from lateral response is generally smaller, due to interaction with the neighboring buildings. Damage has also often been caused in a building from falling debris from adjacent, taller buildings, normally unreinforced structures. Another common observation, particularly in urban, compacted blocks, has been increased damage to corner buildings, probably caused both by their position in the block and also by a lack of symmetry in exterior walls created by the two street front walls having many openings. These conditions were used to modify average damage equivalent to MMI intensity steps. Similar to the story height modification, higher adjacent unreinforced buildings were assumed to increase damage only in the unstrengthened condition.

Damage modifications related to adjacencies were made as follows:

Condition	Result	Unstrengthened	Strengthened
Each side party wall with equal height	Battering damage	+.125	+.125
Each side party wall with unequal height	Out-of-plane failure	+.25	+.25
One side higher	Falling debris	+.25	0
Two sides higher	Falling debris	+.5	0

Two sides lower - any building	Abrupt change in stiffness	+.25	+.25
Two sides equal or higher - (not unreinforced)	Restraint	-.25	-.25
Two sides street - Two opposite sides - any building	Corner building	+.25	+.25
Parapet	Falling debris	+.00 @ 0.5	0

Parapets start to fail if the local intensity is greater than MMI-VI, especially for high parapet structures (height > 24"). To account for the condition in the event of an MMI in the range of VII to VIII, damage was increased by 0.5 step; for MMI less than VI, the presence of a parapet would not increase MMI - IX, the building itself would be severely damaged, and the parapet would not add extra damage to the building.

Damage-Casualty Relationships

Casualty rates for earthquakes have generally been estimated for the entire population at risk in the event of a quake. Specific casualty estimates related to an earthquake victims location in relation to the specifics of building configuration, is a type of data that has not been collected during any prior quake experiences. Therefore, the analysis and use of actual data cannot be relied upon for this part of the model program; instead, casualty data needs to be predicted in relation to building type on the basis of actual number of occupants per building. The most recent assessment of rates more closely related to individual buildings was presented in ATC-13 (ATC, 1985). These fatality rates were predicted as follows:

Central Damage Factor (%)	:	0	.5	5	20	45	80	100
Fatality Rate	:	0	$1/10^6$	$1/10^5$	$1/10^4$	$1/10^3$	$1/10^2$	1/5

Rates had previously been proposed by individual building types for a major earthquake by the California Seismic Safety Commission for the purpose of evaluating California owned buildings (CSSC, 1979). These values were:

Condition	:	Unstrengthened	Attainable by Strengthening
Fatality Rate	:	4,000/10,000	15/10,000
		[2/5]*	[$1.5/10^4$]

The rates used by the California Seismic Safety Commission are clearly designed to be applied to the number of building occupants. Although not specifically stated, the ATC rates also seem to be intended to be applied to the number of building occupants. Considering that the most common failure mode for unreinforced buildings is the outward collapse of walls or parts of walls, the exposure for life safety hazard is probably not directly proportional to occupancy of the building. This is particularly true in a downtown area, where there has been great concern expressed over hazard to pedestrians in congested areas.

The population at risk was therefore considered to be both the occupants in the buildings and the pedestrians in areas (streets, alleys, or yards) directly outside the buildings. The population inside unreinforced buildings was calculated using square footage, building uses, and probable occupancy loads obtained from the City of Ventura Building and Safety Division. The population exposed to hazards outside of unreinforced buildings was calculated using lineal feet of exposure per building face and population densities for various open area conditions estimated by the Planning Corporation based on pedestrian count data obtained during peak weekday exposure hours.

Pedestrian exposures were developed by performing a sequence of counts along Main Street between Figueroa and Chestnut. The counts were performed every quarter-hour along this street by teams of individuals. All persons on a street segment within a one-minute period were counted; counts were performed from about 11:45 to 1:15. The peak period exposure was based on observations provided by City staff. Double counting was avoided by having each counting team member survey only one side of the street during an approximate one-minute interval. Using this procedure, compared to statewide averages and typical retail areas in southern California, the pedestrian counts for Ventura (per 1000 lineal feet) were very low (which in turn reduced the hazard exposure for pedestrians).

The resulting exposure rates obtained using these estimation procedures are shown in **Table 7-1**. The rates estimated (and therefore the absolute number of deaths predicted) are thought to be accurate to within a factor of 2 at the high end (large earthquake, large number of deaths) and to within a factor of 4 at the low end (small earthquake, small number of deaths). Prediction error therefore was greater for a lower intensity event. However, since similar rates are applied to all the retrofit alternatives considered, comparisons can be made without application of such large error factors. Hospitalized injuries were predicted to be four times total deaths (Steinbrugge et al., 1972; ATC, 1985).

The fatality rates were defined as follows (based on San Francisco data):

1. Using gross fatalities in the Bay Area that have been previously published (Steinbrugge et al., 1972; Steinbrugge et al., 1981), the total number of fatalities ascribed to unstrengthened unreinforced buildings in San Francisco were estimated to be between 1,000 and 1,500 for the 8.3 San Andreas scenario. This number also appears to be of the right order of magnitude considering the estimated 700-800 deaths in San Francisco in 1906, and the deaths estimated for other California earthquakes that have effected significant number of unreinforced structures (Steinbrugge, 1982; ATC, 1985).

2. Using the calculated populations at risk in the buildings and on the street, and assuming a 2.5 ratio of street death to building deaths, the ATC-13 fatality rates in the 5-45% damage states were proportioned to generate the 1,000-5,000 range of deaths for the 8.3 San Andreas event in the 5-6pm time period. The ATC fatality rates for 80% and 100% damage were not changed.

3. The rates were further refined by running a simulation of the Loma Prieta event and setting deaths to greater than zero but less than 20 for the unstrengthened case.

4. The engineering consultants also determined that the characteristics of the **Level II** alternative would produce more damage than the **Level III** alternative without a proportional increase in casualties. Since life threatening damage cannot be differentiated from damage in the methodology of this study, fatality rates for these alternatives were adjusted to reflect a condition where damage in strengthened buildings is likely to be of a different type and less threatening than the damage in unstrengthened buildings. An assumption that was also incorporated into the model predicted that for a given percentage of damage in the **Level II** alternative, the same percentage of damage in **Level III** would be less life threatening. Since the strengthening work in **Level I** would also change the nature of failure modes, minor adjustments were also made to these fatality rates consistent with the adjustments described above. Considering that fatality rates are normally estimated only to an order of magnitude of accuracy, these adjustments are considered minor and justified to better reflect probable building performance.

TABLE 7-1
Occupancies for Calculation of Exposure to Fatality Rates

1. In-building (occupants per 1000 square feet)

Occupancy	Day	Night	Average
Residential	1.2	3.1	2.5
Office	4.0	0.3	1.5
Commercial	10.0	0.5	3.5
Industrial	2.5	0.25	1.0
Assembly	2.0	0.25	1.0

2. On street (occupants per 1000 linear feet one side).

Occupancy	Day	Night	Average
Busy	25	1	10
Intermediate	5	0.2	2
Quiet	3	0.1	1
"Yard"	1	0	0.3

Loss of the Use of Buildings after an Earthquake

General Methodology

As discussed in Chapter 7, loss of the use of buildings (or "downtime") can form a significant portion of total monetary losses from damage in an earthquake. Statistical data on downtime does not exist in the literature, although isolated anecdotal information is available, particularly related to the Loma Prieta event. ATC-13 (ATC, 1985) has predicted loss as a function related to damage (as a percentage of replacement cost) for different occupancies based on expert opinions. The ATC-13 relationships do not consider size of building nor is the concept of a critical loss level used. **Critical loss level is the loss which is likely to trigger demolition or major reconstruction rather than immediate repair and reoccupancy.** A critical loss level of 65% of replacement cost was recently suggested for mid-rise buildings (EERI, 1989).

Critical loss level was considered important in this study because it would yield a measure of the loss of building stock as a result of a moderate to strong quake. Loss of building use as described by the model was partitioned into a portion representing a long-term loss (damage resulting in demolition) and a portion of the building inventory that was presumed to be repaired. Buildings that are repairable would be temporarily closed due to emergency engineering evaluations and may be partially or totally unusable while under repair. Repair times can be estimated using rates based on reasonable daily expenditures by contractors and dollar losses per building based on cost of square footage for different occupancy building.

The general damage and casualty estimates included in the model were based on averages incorporating information related to many buildings. There is insufficient information available on each building and insufficient historical data to consider realistic calculations for individual buildings. However, the logic proposed for use in estimating number of building demolitions and lost time is based upon probable

outcomes under realistic individual building damages, not averages. This is an important limitation of the model and **individual building owners need to be aware that a predicted loss in this model may not accurately represent the conditions in a single building but that the predicted losses, when averaged over the entire building stock, are considered relatively accurate predictors.** For example, if the critical loss level is set at 50% of replacement cost, each building suffering over 50% damage is likely to be demolished, regardless of what the average damage is. For downtime calculations, therefore, the following procedure was used:

1. For each building, using the average damage calculated as previously explained, the likelihood of all damage states was calculated, using probability distributions suggested in ATC-13.

2. The probability that the individual building would be damaged over the critical loss level was multiplied times the building square footage and that area was accumulated over all buildings as long term loss. The number of occupants associated with this square footage was also accumulated using the appropriate occupant load (occupants living or working in the building).

3. The downtime associated with each damage state below the critical loss level was calculated and multiplied by its probability of occurrence to obtain a weighted downtime, in days lost, that would appropriately consider the building's likely dollar damages. The calculation of weighing factors based on the probability distribution of damage is discussed in more detail in the Technical Appendix.

4. The total occupants living or employed in the building (shown in **Table 7-1**) was then multiplied by the days lost to obtain "occupant-days" lost.

Long-Term Loss

Long-term loss of building use was assumed to occur in seriously damaged buildings due to likelihood that demolition would occur or due to long delays (4-6 months) in the decision-making process which could result in either demolition or massive reconstruction. The effect of these delays on occupants was presumed to be the same for either demolition or long delay. Such delays have been conformed in reviews of the Loma Prieta quake effects in Watsonville (Chapter 8).

Critical loss levels were set at 40% replacement costs for unstrengthened buildings and 50% replacement cost for strengthened buildings. These figures represent repair costs in the $25-35 per square foot range. Forty to 50 percent damage is a lower cut-off than has been suggested for other buildings, but unreinforced buildings as a class are more likely to have other liabilities, such as inadequate fire protection, handicap access, and building service systems, which could affect an owner's decision to repair or demolish. The higher cut-off of 50% was used for strengthened buildings on the assumption that owners who have spent money on seismic strengthening (and probably other improvements) are more likely to attempt to salvage their buildings.

The total long-term loss estimate is quite sensitive to the critical loss level chosen. A parameter study was done in San Francisco for a Magnitude 8.3 San Andreas event, the loss was estimated at 12,000,000 sq. ft. (using a 50% critical loss level) and 18,000,000 sq. ft.(using 40%). Areas not included in long term loss were, of course, accounted for in the occupant-days lost category, as damage to such areas were assumed to be immediately repairable. The most representative view of the effect of damage on occupants is a combination of "occupant-days lost" and "occupants affected by long term loss". To obtain such a combined parameter, "occupants affected by long-term loss" must first be converted to the equivalent of "occupant days lost" by multiplying it by a time period to represent the effect of long-term closure or demolition; 200 to 350 days is suggested. This product can then be added to "occupant days lost" and the sum used to compare various scenarios. It should be recognized, however, that embedded in the calculation of both "occupant

days lost" and "occupants affected by long-term loss" are lengthy losses of building use which would undoubtedly result in use of alternate facilities. The time period that separates building closures that directly relate to business or personal loss and closures that will result in relocation is probably highly variable. The parameters discussed therefore should be considered to be a measure of the time the affected occupants would be forced out of their original building and not directly related to business loss or the need for temporary shelter.

In response to comments from both building owners and the City, an attempt was made to estimate the cost to repair structures damaged by future earthquakes so a total prediction of the economic effects could be derived of adopting one or another of the various levels of upgrade. The model results were modified to produce an answer to the question: how much would a building owner have to pay to restore a building to occupancy after a strong earthquake and assuming a building was upgraded to **Level III** standards. The answer to this question is now provided in Chapter 11 of the EIR where the costs and benefits of various options are compared.

Losses Due to Repairs

It was assumed that buildings damaged below the critical loss level would be repaired as soon as possible. Labor and material necessary for repair were assumed to be available without undue delays. Such shortages did not materialize after Loma Prieta but certainly may in larger events.

Moderate repair rates were used for all conditions in this study as shown in **Table 7-2**. Repair times were calculated by dividing the dollar loss (replacement value times percent loss) by the appropriate repair rate.

TABLE 7-2
Damage Repair Rates

Total Repair Cost	Repair Rate
<$50,000	$4,000 per day
$50,000 - 200,000	$8,000 per day
>$200,000	$16,000 per day

The total lost time was comprised of (1) an initial evaluation period, the length of which is dependent on the damage state, and (2) the repair period. Repair periods used for lost time were either 33% or 66% of repair times to account for partial or early occupancy within the repair time. The algorithm used for each damage state is shown in **Table 7-3.**

These algorithms were used for each damage state for each building, with the lost days calculated weighted by probability of occurrence of a particular damage state. Finally, the days lost in each building were weighted to consider the number of occupants affected (by multiplying the loss times the effective occupancy from **Table 7-1**) to obtain "occupant days lost".

TABLE 7-3
Total Days Lost in Buildings to be Repaired

Damage Ratio	Occupant Days Lost	
	Evaluation Period	Repair Period
0-10%	0	0
10-15%	5	0
15-25%	5	33% Repair Time
25-40% (unstrengthened)	20	67% Repair Time
25-50% (strengthened)	20	67% Repair Time
>40% or 50%	--	Long Term

In addition, a new computation was made which combined the short and long term losses associated with all disruptions to occupants to provide a projection of total occupant disruptions resulting from either a Pitas Point or San Andreas earthquake. Additional discussion of the occupancy days lost predicted by the model has now been included in the analysis of the costs and benefits or the various options considered (Chapter 11).

Summary of Model Inputs

The seismic risk model was derived to characterize the building damage and life loss that would occur in the City of Ventura in the event of a strong to moderate earthquake. Considering the presence of a large number of faults in the Ventura area, the selection was made of possible seismic events that spanned the range of potential earthquakes that could effect the City. The seismicity of Ventura has the following unique attribute: the most likely seismic event (a 30% chance of occurring in the next 30 years) would result from movement on a fault that is quite distant from the city (the San Andreas) while the least likely event (a 1% chance of occurrence in the next 30 years) would result from a movement on the nearby Pitas Point - Ventura fault. As a result, the most damaging potential event is the least likely to occur.

The major inputs to the model - in addition to data about seismic potential - included:

- o the location and physical attributes of each building;
- o the occupancy of each structure and expected pedestrian exposure along facades;
- o variable characteristics of the soil under buildings in different parts of the City;
- o data about the presence of party walls (shared walls) between buildings and adjacency characteristics (relative height or adjacent buildings); and
- o Selective comparative information (regarding variability in the reaction of prototype building shape variation to quake events, for example) obtained from more refined modelling on San Francisco structures.

The model was used to predict four conditions:

(1) a worst case event - movement along the Pitas Point - Ventura Fault during peak pedestrian and building occupancy periods; and

(2) a probable event - movement along the San Andreas Fault, during a worst case time period (peak pedestrian and building occupancy); and

(3) a probable event - movement along the San Andreas Fault, during a time when building and street occupancy would be low; and

(3) the fourth condition presented in the model is termed `annualized risk' which converts all the seismic events considered into the probability of occurring in a single year. This risk was then compounded to derive the risks associated with a 30 year time period so the annual risk data would be directly comparable to the 30 year movement probabilities associated with the other faults studied.

Having reviewed the major inputs to the model in both a technical and non-technical manner, the next objective is to present the model results and convert them to easily interpreted summary statistics.

7.3 Model Results: Summary Tables

The complete set of model results generated by Rutherford and Chekene are provided in the EIR Technical Appendix. These results were then simplified by rounding each result to the nearest whole number (for example, a life loss projection of 2.3 lives was simplified to 2 lives) and the results were divided into building damage reduction and life loss projections (discussed in this chapter) and socio-economic consequences (discussed in chapter 11). Differences in model results between the Draft and Final EIRs are attributable to (1) the elimination of the soil liquefaction factors used in the Draft EIR, (2) changes in the annual loss summaries from a 50 year interval to a 30 year interval, and (3) minor modifications to the model based on comments and responses.

Two sets of related tables were generated to present model projections related to death, injury, and building damage. Socio-economic model results are provided in chapter 11. **Tables 7-4** through **7-7** summarize the number of anticipated fatalities, injuries, building demolitions, and seriously damaged square footage for the following conditions:

- Table 7-4: **no strengthening** requirements
- Table 7-5: **Level I** upgrade
- Table 7-6: **Level II** upgrade
- Table 7-7: **Level III** upgrade.

Within each table, the potential effects of a movement on the San Andreas, Pitas Point, and annual probabilities for the next 30 years are provided; the tables also summarize Richter Magnitudes and probability of occurrence.

The results of the model were also presented graphically to facilitate comparison of the relative benefits of each level of strengthening. The data summarized in these graphs present a comparison of the effects of various levels of strengthening given anticipated movements on the San Andreas, Pitas Point-Ventura, and all regional faults (annualized over a 30 year period). These results include the following projections:

- Figure 7-1: Number of buildings demolished

- o Figure 7-2: Number of fatalities
- o Figure 7-3: Number of hospitalized injuries

A comparison of these tables with the model results in the Technical Appendix will reveal that several simplifications have been made in the Rutherford and Chekene presentation to facilitate interpretation of the data. First, pedestrian and building occupancy fatalities have been summed in **Tables 7-4** through **7-8.** Persons interested in the allocation of deaths and injuries between pedestrians and building occupants should refer to the Rutherford and Chekene Technical Appendix. The number of buildings demolished was calculated by dividing the total long term area loss by the average building size in Ventura (about 5,000 square feet) which was the procedure used to derive the number of building demolitions anticipated since this number is not presented directly in the model results. Finally, seriously damaged square footage in **Tables 7-4** through **7-8** is equivalent to the "long term area loss" column in the Rutherford and Chekene results. The use of building demolition counts rather than total square footage in computing long term losses results in a much more understandable approximation of building damage.

7.4 Model Results: Interpretations

A set of statistical summaries converted into graphs were generated to assist in interpreting the results of the simulations. Information from related sets of tables was organized to facilitate comparisons between model outputs under various strengthening options. A summary of the model results and implications is provided in this section. Also, the level of strengthening required to achieve both basic life safety and building damage reduction goals is reviewed.

Building Losses

Figure 7-1 summarizes the predicted **building losses** for each type of earthquake event included in the simulation. Building losses were calculated by dividing the total square footage predicted to be demolished by the average unreinforced building square footage in the City. This operation converted total square footage losses into numbers of buildings that would be demolished under the assumption that when damage percentages reached 40% to 50%, buildings would be demolished rather than repaired. The rationale for this decision is fully defended in the Rutherford and Chekene EIR Technical Report.

By inspection of **Figure 7-1**, it is evident that absent some form of upgrade program in place, nearly 50% of the unreinforced building inventory in the City would be damaged severely enough to warrant demolition in the event of an earthquake on the Pitas Point fault. Also evident by inspection, a **Level I** upgrade would significantly improve the survivability of the building stock although still more than 25 buildings would be lost if only this level of upgrade is required. Compared to **Level I** building protections, only about 13 additional buildings would potentially be preserved if a **Level II** upgrade is required. As a crude measure of cost-benefit ratios, **it is evident that the Level I upgrade provides considerable protection of the building stock for a relatively small investment in upgrading technology.**

TABLE 7-4
THE NO PROJECT OPTION: PROBABLE CONSEQUENCES WITHOUT STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	3	10	5	27,918
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	21	85	62	339,012
Possible Consequence within 30 Years	4	15	25	133,680

TABLE 7-5
PROBABLE CONSEQUENCES WITH LEVEL I STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	1	2	None	1,817
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	14	57	25	138,825
Possible Consequence within 30 Years	2	6	6	34,740

TABLE 7-6

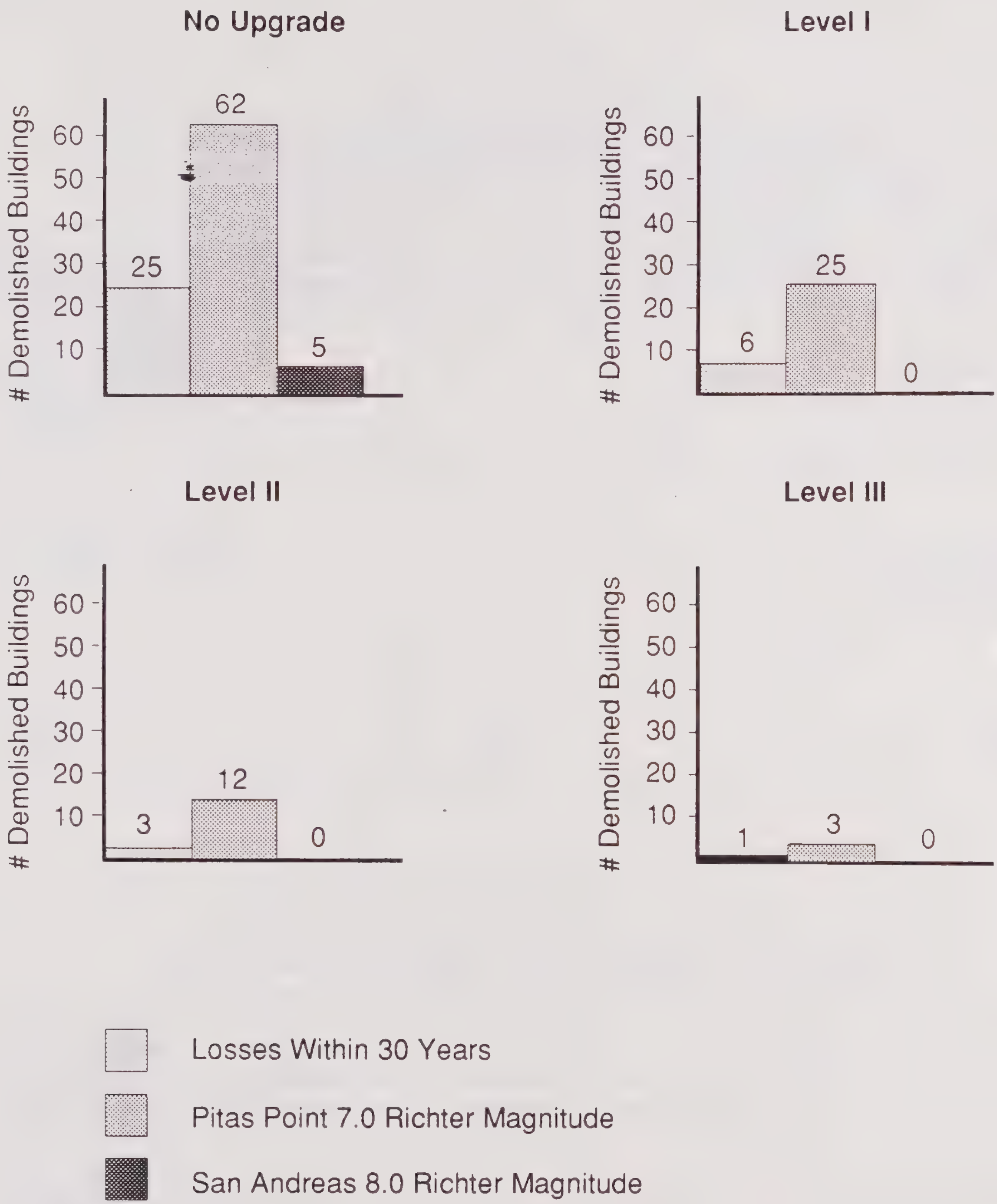
PROBABLE CONSEQUENCES WITH LEVEL II STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	None	1	None	Less than 500 square feet
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	8	31	12	64,887
Possible Consequence within 30 Years	1	None	3	16,320

TABLE 7-7

PROBABLE CONSEQUENCES WITH LEVEL III STRENGTHENING

	Fatalities	Injuries	Buildings Demolished	Seriously Damaged Square Footage
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	None	None	None	Less than 200 square feet
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	1	7	3	59,262
Possible Consequence within 30 Years	None	None	1	5,520

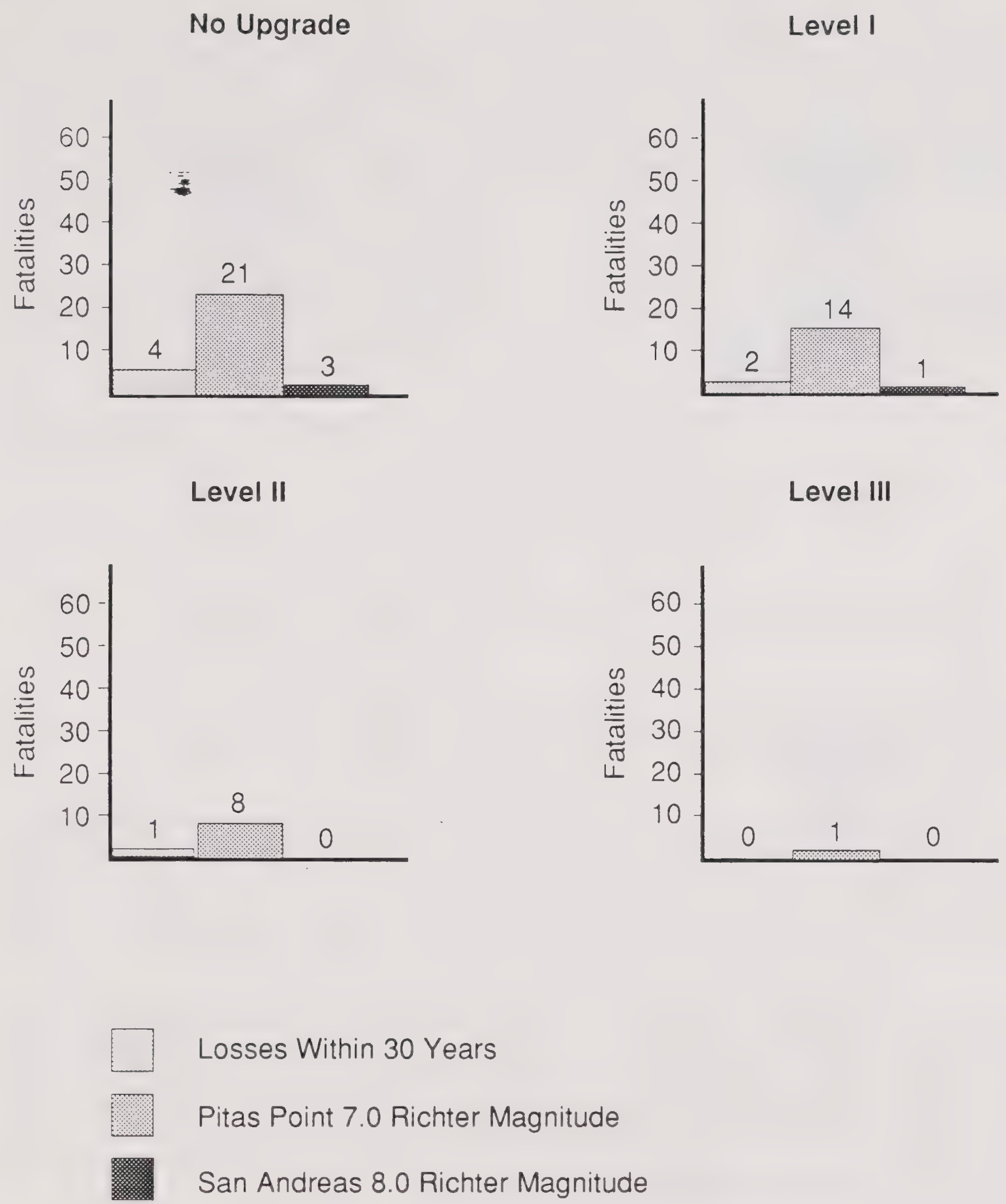


Seismic Risk Model: Summary of Results

Ventura Unreinforced Masonry EIR

Number of Potentially Demolished Buildings

Figure 7-1

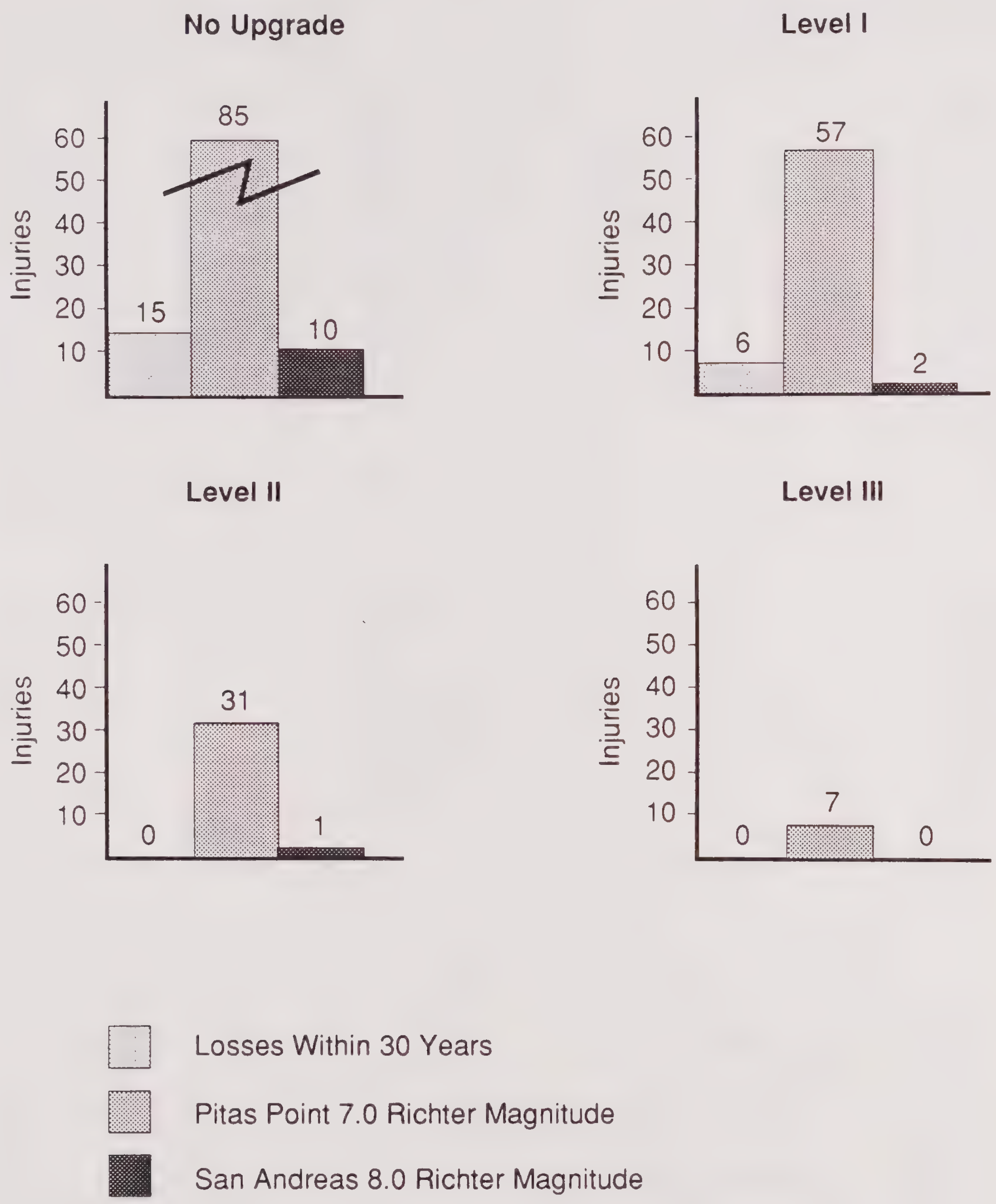


Seismic Risk Model: Summary of Results

Ventura Unreinforced Masonry EIR

Number of Fatalities

Figure 7-2



Seismic Risk Model: Summary of Results

Ventura Unreinforced Masonry EIR

Hospitalized Injuries

Figure 7-3

The distinction between potential effects given the high probability San Andreas event and the low probability Pitas Point quake is acute; a **Level I** upgrade would be sufficient to prevent any damage to the point of demolition for an event on the San Andreas. Under the no project condition (no ordinance adoption), only 5 buildings would be lost if an event occurs on the San Andreas. In contrast, with an event on the Pitas Point, nearly half of the building stock would be lost. **The policy question that this data generates is: should the upgrade requirements be based on the high probability San Andreas event or low probability Pitas Point occurrence.**

The annualized probabilities reinforce the substantial improvements generated by a Level I upgrade. Without at least a Level I program, it is anticipated that earthquakes occurring during the next 30 years will result in the possible loss of 25 buildings whereas, with Level I strengthening in place, these losses would be reduced 75% to about 6 buildings.

Based on a review of the model results, the following conclusions regarding the efficacy of a Level I upgrade as a building damage reduction technique are warranted:

- The Level I upgrade clearly provides the highest cost-benefit value for building damage reduction for all types of earthquake events; and

- The Level I upgrade would protect most of the City's building stock from demolition (with the exception of about two buildings) if a movement occurs on the San Andreas;

- The Level I upgrade would only be partially effective if a movement occurs on the Pitas Point-Ventura Fault. This level of strengthening would fail to provide adequate structural support for about 19% of the building stock (25 buildings).

The additional building damage reduction that would result from strengthening open store fronts (a Level II program) would provide no appreciable improvement given an event on the San Andreas and only about a 10% improvement (demolition of 13 less buildings) given a Pitas Point-Ventura fault movement. Taking these and other factors into consideration, if building damage reduction was the only objective of a proposed ordinance, a Level I program would provide very substantial survivability for the building stock at relatively low cost.

Therefore, taking building damage alone as a predictor for the level of strengthening to adopt, and considering economic data included in chapter 11, adoption of a Level I strengthening standard would be a reasonable and prudent course of action. This conclusion should be tempered with the obvious caveat that without question, the Level III program clearly provides the most effective building damage reduction program possible for the City. Even in a serious earthquake, only three buildings would be damaged to the point that demolition would be required.

Fatalities and Injuries

Figures 7-2 and **7-3** summarize the model projections regarding the incidence of fatalities and injuries predicted for movements on the San Andreas, the Pitas Point-Ventura, and other local faults subject to movement in the next 30 years. Without some form of upgrading in place, the model predicted that several lives would be lost even if an earthquake occurs on the San Andreas Fault, clearly the less damaging potential quake event that the City may experience in the near future. The model predicted that the more intensively damaging potential event on the Pitas Point Fault would generate approximately 21 fatalities if no strengthening is required. Over the next 30 year period, the model predicted with certainty the loss of at least 4 lives without some form of strengthening in place.

The remarkably apparent improvement in building damage reduction resulting from the adoption of a Level I upgrade (illustrated in Figure 7-1) does not translate directly into a corresponding level of reduction in fatalities and injuries (illustrated in Figures 7-2 and 7-3). Given a movement on the Pitas Point-Ventura Fault, The reduction in fatalities attributable to a Level I upgrade is relatively small (21 deaths without an ordinance and 14 deaths with a Level I ordinance). Correspondingly, given a San Andreas earthquake, the reduction in life loss from 3 persons to 1 person does not provide complete life safety protection. When the hospitalized injury data is taken into account, the same relationship is observed: a Level I program is not efficient in reducing injuries and deaths given a movement on the Pitas Point-Ventura fault and provides improvement but not complete protection from death and injury given a San Andreas earthquake. Not surprisingly, a Level II program (designed to address open store front hazards and associated pedestrian exposures) provides very substantial additional improvement in fatality and injury reduction for the Pitas Point Fault and substantially reduces injuries and prevents fatalities given a San Andreas earthquake.

Based on a review of the model results, the following conclusions regarding the efficacy of a Level I upgrade as a life safety and injury reduction technique are warranted:

- The **Level I** upgrade would not prevent all potential fatalities given the projected movement on the San Andreas;

- The **Level I** upgrade would provide a relatively low level of improvement over unstrengthened conditions given an earthquake on the Pitas Point-Ventura fault (a reduction in the death rate from 21 to 14 persons);

The **Level II** upgrade results in impressive additional life safety protection over a Level I program even for a serious earthquake on the Pitas Point-Ventura fault. However, only a **Level III** program would provide nearly complete life safety for the City of Ventura. This finding is consistent with the general intent of a Level III ordinance which is primarily to nearly completely reduce death and injuries from earthquakes.

Therefore, taking death and injury projections alone as a predictor for the level of strengthening to adopt, a **Level I** strengthening standard would not provide adequate life safety protection and injury reduction. Given the addition life loss improvement and injury reduction features of a **Level II** ordinance, adoption of a **Level II** standard would be a reasonable and prudent course of action. This conclusion can only be made with full realization that only a Level III program actually provides nearly completely effective death and injury prevention. Lesser programs simply do not accomplish the objective of reducing death and injury to negligible levels. Therefore, taking only life safety concerns into account and disregarding the potential economic consequences of adopting such a standard for some building owners, a **Level III** mandatory upgrade is the only program that nearly completely accomplishes the life safety and injury reduction objectives of an ordinance.

Clearly, the **Level III** program would provide the best protection to the population in the event of an earthquake. It is relatively obvious why many jurisdictions in the State of California are opting for the **Level III** option if the model results predicted in this case are typical of statewide conditions.

The City Council needs to review the life loss predictions provided in these outcomes and determine a balance between the low risk of injury and death against the high costs of a truly effective retrofitting program. **The data suggests that Level I upgrades would not provide effective life safety protection if a movement occurs on the Ventura-Pitas Point; a Level II upgrade would also result in about 8 fatalities if a movement occurs on the Pitas Point Fault,** but this degree of improvement is substantial over Level I protections, and, from a cost-benefit standpoint, a very reasonable option. **Clearly, a Level III upgrade requirement would provide the** only really effective **protection** from death and hospital injuries.

Socio-Economic Consequences

The number of persons potentially displaced by building demolitions indirectly predicts the degree of dislocation and economic hardship that would be experienced in the event of an earthquake. Given the very small number of residential buildings in the model inventory, the displaced persons in this case would experience economic dislocation (job loss, relocation of businesses, damage to or loss of inventory, business closure, etc.). These concerns, originally discussed in this chapter of the Draft EIR, are now addressed in chapter 11. In addition, chapter 8 provides considerable anecdotal information about the consequences of a Pitas Point type of earthquake on the business community using Loma Prieta as a model.

Summary of Model Results: Predicted Improvements with Various Levels of Strengthening

To isolate the improvement associated with each increasingly protective level of strengthening, an additional set of summary tables were prepared (Tables 7-8 through 7-9). These tables summarize (1) the number of lives saved, (2) the number of injuries avoided, and (3) the number of buildings which are spared demolition for each of the following strengthening programs:

- Table 7-8: **Level I** upgrade
- Table 7-9: **Level II** upgrade
- Table 7-10: **Level III** upgrade.

These tables have been organized to provide the decision makers and the public with simple answers to these related questions: if a given level of strengthening is adopted as a mandatory strengthening program, compared to conditions without any strengthening requirement, how many lives would be saved, how many injuries would be avoided, and how many buildings would be saved from demolition?

7.5 Summary of Model Results: Policy Implications

Converting these predictions to policy recommendations is a difficult but necessary undertaking. This discussion introduces the importance of considering cost-benefit factors which are discussed more thoroughly in a subsequent chapter. The following observations are intended to provide ideas, suggestions, and guidance. However, only the decision makers can establish the important thresholds of life loss and damage acceptability that the model results imply must inevitably be made.

The first obvious conclusion that the model results make evident is that even with adoption of a **Level III** standard, **some life loss and building damage will be experienced regardless of the level of strengthening adopted.** The range of earthquake events that reinforcement programs are supposed to protect the public from are of considerable importance in deciding what type of ordinance to require. Expressed simply, what must be defined is the type of event that design measures are conceived to withstand. **The consultant recommends that the Pitas Point event be treated as the design event that the adopted strengthening program is supposed to accommodate.**

It is very difficult to establish an acceptable level of life loss in analyzing earthquake consequences. If the basic objective of adopting an ordinance is to prevent death and reduce injury, **unacceptably high loss of life** and injury **would result from** adoption of either a **Level I or II upgrade option.** If the dominant objective of adopting an ordinance is to reduce life safety risks to the degree feasible, only **the Level III option** achieves this objective satisfactorily for all of the potential earthquake events that were considered in the model. A **Level II** program, however, provides substantial life safety improvement over the simpler **Level I** option and, if a **Level III** program is not adopted, then the most prudent and effective (but less satisfactory option) would be adoption of a **Level II** standard.

TABLE 7-8
PREDICTED IMPROVEMENTS WITH LEVEL I STRENGTHENING

	Number of Lives Saved	Number of Injuries Avoided	Number of Buildings Saved from Demolition
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	2	8	5
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	7	28	37
Possible Consequences in 30 Years	2	9	19

TABLE 7-9
PREDICTED IMPROVEMENTS WITH LEVEL II STRENGTHENING

	Number of Lives Saved	Number of Injuries Avoided	Number of Buildings Saved from Demolition
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	3	9	5
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	13	54	50
Possible Consequences in 30 Years	3	15	22

TABLE 7-10

PREDICTED IMPROVEMENTS WITH LEVEL III STRENGTHENING

	Number of Lives Saved	Number of Injuries Avoided	Number of Buildings Saved from Demolition
San Andreas Earthquake 8.0 Richter Magnitude Event (30% chance of occurrence in 30 years)	3	10	5
Pitas Point Earthquake 7.0 Richter Magnitude Event (1% chance of occurrence in 30 years)	20	8	59
Possible Consequences in 30 Years	4	15	24

However, if the objective of an ordinance is building damage reduction, a Level I program is a reasonably effective program, especially when compared to outcomes if no strengthening is required. Taking costs into account, the Level I program provides very effective building damage reduction. **Although not particularly effective if a strong movement occurs on the Pitas Point-Ventura fault, the Level I program is a reasonable and prudent course of action for the City, especially taking cost-benefit considerations into account.**

These findings obviously create a difficult dilemma. **While partially effective, a Level I or II ordinance does not accomplish the objective of reducing deaths and injuries to the degree feasible while a Level I or II program is reasonably effective in building damage reduction.**

Similarly, direct measures of significant damage to the building stock and indirect measures of socio-economic loss show modest though not impressive improvement with **Level II** upgrades. The decision-makers will need to decide if the temporary or long-term loss of about 400 jobs, disruption of approximately 40 businesses, 8 deaths, over 31 major injuries, and the demolition of about 12 buildings is a tolerable level of damage and destruction--this is the predicted outcome with **Level II** upgrading assuming an event on the Pitas Point. Expressed in annualized loss terms over a thirty year period, there is assurance that if **Level II** upgrades are required, a very substantial improvement over unstrengthened conditions would be realized. With this level of strengthening, it is probable that if an earthquake occurs, relatively few people would be injured to an extent that hospitalization would be required, only about 1 fatality would be anticipated, and only about 3 buildings would be eliminated from the current building stock. **Considering the improvement Level II provides over existing unstrengthened conditions and given the substantial improvement in life safety that results with this type of strengthening, adoption of a Level II ordinance requirement would be a prudent course of action, especially if the economic variables are taken into account.**

The **Level I** upgrade appears to provide only adequate life safety and building damage reduction for an earthquake typical of what might occur on the San Andreas fault. For this reason, the **Level I** upgrade is not a recommended design solution. More intense local events on the Pitas Point or other faults in the Santa Barbara region would result in serious consequences for the community for which **Level I** upgrades cannot adequately compensate. The policy decision that is implicit in determining that a **Level I** upgrade is acceptable is that the probability that a quake will occur on other more potentially serious faults is sufficiently remote to be ignored. This is not advisable. The use of the San Andreas earthquake as a predictor for life loss and injury potential in Ventura is not encouraged. It would be very misleading to decide upon a future upgrade ordinance solely on the probability of building damage and life loss that would be experienced during a San Andreas event. There is also some question about the seismicity of Ventura in the event of a San Andreas quake and this uncertainty should be taken into account in making a decision about acceptable life loss and building damage values.

In summary, from the standpoint of protecting life, minimizing damage on building stock and preventing economic dislocations, the Level III ordinance is advised if protection and recovery from a Pitas Point type of event is the design objective. With a San Andreas design event, **Level I** upgrade requirements provide reasonable protection. Accepting a Pitas Point type of event as the design objective clearly indicates a **Level III** upgrade should be adopted. Although a **Level III** program is the only option available to reduce life loss and injury potential to nearly insignificant levels, a **Level II** program would also provide very considerable improvement in sustaining the City's building stock and in minimizing death and injury even from an event on the Pitas Point-Ventura fault.

Summary

Summarizing the results of the Seismic Risk Model, it is now possible to provide simple answers to the questions posed at the beginning of this chapter.

Question: How many lives would be lost in the event of a moderate to strong earthquake if no upgrading is required?

Answer: The amount of life loss is dependent on the type of quake that occurs, its duration, and the location of the fault movement in relation to the City. Of the two quake events modelled, the worst life loss is predicted if a movement occurs along the Ventura-Pitas Point fault. Under worst case conditions, as many as 21 fatalities and about 85 serious injuries are expected without strengthening. If a less serious but more probable strong earthquake occurs on the San Andreas, about 3 fatalities and 10 serious injuries are anticipated. Projecting annual risks over a thirty year period, it is anticipated that without strengthening, about 4 deaths and 15 injuries would occur in Ventura.

Question: How many fatalities and injuries would occur and how extensive would building damage be if an earthquake occurs on either the San Andreas or Pitas Point-Ventura Faults? What life safety and building damage reduction improvements would result from implementing a **Level I** or **Level II** upgrade?

Answer: With increasingly stringent levels of reinforcement, fatality and major injury estimates decrease. Worst case life loss and injury estimates project only 1 death and 7 injuries after reinforcement to Level III standards. The **Level III** program provides the most effective life loss and building damage reduction achievable (of the options studied). **Level I** and **II** upgrades provide some reduction in fatalities and injuries but only the **Level III** strengthening would effectively reduce potential fatalities to one or less persons during an earthquake on the Pitas Point-Ventura fault.

Substantial building damage reduction is accomplished through the implementation of a **Level I** or **II** upgrade. Considering only an event on the San Andreas, building damage to a degree that demolition would be necessary is predicted to be very minimal with only a Level I upgrade. This low level of building damage is not predicted for an earthquake on the Pitas Point-Ventura fault. Without some form of strengthening ordinance in place, nearly half of the unreinforced buildings in the City would need to be demolished if there is a strong movement on the Pitas Point fault. With increasing levels of strengthening, this percentage is reduced considerably (25 buildings demolished with **Level I**, 12 buildings with **Level II**, and 3 buildings with **Level III**).

Question: Would adoption of a program similar to the State Model Ordinance (a **Level III** upgrade) further enhance life safety and building damage reduction beyond the **Level I** or **II** options?

Answer: The adoption of the **Level III** upgrade requirement is far superior to either the **Level I** or **II** options. Only the **Level III** upgrade provides effective reduction of fatalities if a moderately strong earthquake emerges from movement of the Pitas Point-Ventura Fault. The **Level III** option is also the only effective method for assuring that building damage losses are reasonably minimized. The **Level I** and

II upgrades are primarily effective for movements on the San Andreas fault (or a similarly intense quake on another distant fault).

Question: What degree of building damage reduction would be achieved with each of these alternatives?

Answer: The tables and graphics presented in the preceding section illustrate in considerable detail the degree of damage reduction and life safety enhancement that each strengthening level achieves. The most effective mitigation program would clearly be adoption of the **Level III** alternative. The cost effectiveness of this option and the economic effects of a mandatory **Level III** upgrade program are discussed in subsequent chapters. If cost factors are taken into account, a **Level I** or **II** program is a reasonable and prudent alternative. However, these alternatives provide less life safety protection than the **Level III** option.

7.6 Comparison of Fatality Risks from Earthquakes and Other Common Sources of Death and Injury

Comparisons of Various Sources of Death

One of the commonly raised comments on the Draft EIR was that no direct comparison of the risks of death from earthquakes which might occur in Ventura was made to risks associated with other common sources of death (injuries, illnesses, and accidents). In response to this request, the following data were assembled to put the potential hazards described by the model into the context of general death risk assessment. In response to this interest in risk comparisons, the following probability summaries were derived.

Table 7-11 summarizes risks associated with causes of death in a major urban center (San Francisco) which also has a substantial inventory of unreinforced buildings. This table illustrates the death rate from illnesses, accident, suicides and homicides in San Francisco per 100,000 persons for the year 1987. Data in **Table 12-2** of the EIR documents that the expected death rate for deaths from earthquakes is 1.8 persons per 100,000 population in San Francisco. A similar probability of death computation expected to occur in Ventura during a single year is less than 1 person. **Therefore, the expected annual death rate from earthquakes in both Ventura and San Francisco is lower than the rate for most major illnesses, accidents, suicide, and homicide.** However, although the probability of occurrence of a death inducing earthquake in any single year is relatively low, in the year a major earthquake occurs, the death rate per 100,000 persons is anticipated to be considerably higher than the probability projection for any single year. In Ventura, single year fatalities during the year of a major earthquake would be about 14 persons.

The data in **Table 7-12** present a comparison of the risk of death from an earthquake to the probability of dying from an accidental sports injury. Earthquake death risks for San Francisco are approximately equivalent to the lowest annual rate of death for sports injuries (which is for professional football players--assuming 100,000 football players are active in any single year). **The death rate per 100,000 persons in Ventura expected to occur as a result of an earthquake is less than all sources of sports accidents.**

Comparing earthquake risks on an annual basis to all types of accidents, natural disasters, and nuclear plant failures can be performed by inspecting Table **7-12** and data included in **Tables 12-1** and **12-2**. Between 1971 and 1989, the number of deaths that have occurred from earthquakes during any single year ranged from a low of no deaths to a high of 62 persons in 1989. Averaging this death rate, an annual death rate for the United States can be derived (7 persons per year). This rate is about 1/10th the annual death rate resulting from hurricanes or tornadoes, the closest approximation of the earthquake death rate.

Using the averaging procedures employed in the calculation of risks in **Table 7-12**, in a year that an earthquake occurs (rather than an average annual probability), the total number of deaths would be about half the annual risk of death from hurricanes and tornadoes. Therefore, even in the year when a major

earthquake occurs, the risk of death from earthquakes in the western United States is less than the annual rate of death for all other sources of commonly occurring accidental death itemized in **Table 7-13**. Compared with every source of fatality event except deaths attributed to severe weather conditions, the annual risk of death from an earthquake fails to approach the risks associated with nearly all forms of accident and common forms of illness. **In summary, compared to other risk sources, the annual probability of dying in an earthquake in Ventura is properly characterized as remote.**

However, it is important to stress that these probabilities are sharply reversed in a year when an earthquake occurs. The reduced probability of death from an earthquake is related to the infrequency of earthquake occurrences (compared, for example, to annually occurring hurricanes or tornadoes, the two natural events that come closest to approximating the possibility of death from an earthquake). The reduced annual risk comparison can be misleading, particularly if an area is seismically active or if faults are proximal to hazardous buildings. **Without question, in Ventura, the probability of death from collapsing building debris is higher than many of the accident types listed in Table 7-13, many of which do not constitute the risk profile of life in Ventura.**

<u>Sources of Risk in Downtown Ventura</u>

Likewise, it is important to temper the comparison of risk with the sources of risk to which local residents are exposed. For example, a comparison of the annual risk of an earthquake related deaths from failure of non-ductile concrete, unreinforced masonry or tilt-up structures (**Table 12-3**), when standardized by square footage, clearly indicates that the risk of death is higher for occupants or pedestrians in or near unreinforced masonry buildings. However, when the total number of fatalities is examined (**Table 12-1**), it is clear, for example, that in the San Fernando-Sylmar earthquake, more fatalities resulted from failures in other types of structures rather than unreinforced masonry buildings. But the death sources in San Fernando-Sylmar reflect the composition of the building inventory; the Ventura downtown study area has only 19 potentially hazardous non-ductile concrete buildings (refer to the Technical Appendix for an inventory of these buildings) and over 135 potentially hazardous unreinforced masonry buildings. No tilt-up buildings are present in the study area. **Therefore, based on the square footage of hazardous building types and the death rate associated with each type of structure, the only conclusion that can be drawn is that unreinforced masonry buildings are the most likely hazardous potentially death producing structures in the study area.** Likewise, although more than 60 deaths occurred as a result of the recent Loma Prieta, most of these deaths were attributed to a failure in a bridge facility. The only type of <u>building</u> that produced fatalities in this earthquake were unreinforced masonry structures. This conclusion is clearly illustrated in **Table 7-14**.

Having reviewed the model results and its implications, the next subject to discuss concerns comparative data regarding the accuracy of the model. This cross-checking is provided by reviewing the consequences of a Pitas Point type of event on a city similar to Ventura. This verification process will be completed by reviewing the effects of the Loma Prieta quake on buildings, businesses, and people residing in Watsonville, California.

TABLE 7-11

MAJOR CAUSES OF DEATH IN SAN FRANCISCO

Figures are for 1987 Cause of Death	Rate per 100,000
1. Major cardiovascular	454.0
2. Cancer	251.3
3. Influenza and Pneumonia	47.4
4. Accidents (excluding motor vehicles) Motor vehicles	30.2 8.0
5. Cirrhosis of the Liver	25.0
6. Suicide	19.6
7. Bronchitis, emphysema, asthma	16.5
8. Homicide	14.8
9. Other respiratory diseases	13.1
10. Diabetes	10.7

Source: San Francisco Department of Health

TABLE 7-12

RISKS OF DEATH IN SPORTS ACCIDENTS
(20 years assumed participation)

Action	Rate per 100,000
Pro football	2
Ski racing	40
Boating (all types)	100
Scuba diving	800
Hang gliding	1660
Parachuting	4000
Home-made plane flying	5883
Air show flying	10,000
Professional stunting	20,000

Source: E.A.C. Crouch and Richard Wilson: "Risk/Benefit Analysis"

TABLE 7-13

INDIVIDUAL RISK OF ACUTE FATALITY BY VARIOUS CAUSES

Accident Type	Total Number for 1969	Approximate Individual Risk Acute Fatality Probability/yr[1]
Motor Vehicle	55,791	3×10^{-4}
Falls	17,827	9×10^{-5}
Fires and Hot Substance	7,451	4×10^{-5}
Drowning	6,181	3×10^{-5}
Poison	4,516	2×10^{-5}
Firearms	2,309	1×10^{-5}
Machinery (1968)	2,054	1×10^{-5}
Water Transport	1,743	9×10^{-5}
Air Travel	1,778	9×10^{-6}
Falling Objects	1,271	6×10^{-6}
Electrocution	1,148	6×10^{-6}
Railway	884	4×10^{-6}
Lightning	160	5×10^{-7}
Tornadoes	91[1]	4×10^{-7}
Hurricanes	93[2]	4×10^{-7}
All Others	8,695	4×10^{-5}
Nuclear Accidents (100 reactors)	0	3×10^{-9} *

[1] Based on total U.S. population, except as noted.

[2] (1953-1971 avg.)

[3] (1901-1972 avg.)

* Based on approximately 15 million people located within 20 miles of nuclear power plants. If the entire U.S. population of about 200 million people were to be used, then the value would be 2×10^{-10}.

TABLE 7-14

LOMA PRIETA EARTHQUAKE FATALITIES

		Watsonville	Santa Cruz	Oakland/ San Francisco	Total
Buildings	Unreinforced Masonry	1	3	4	8
	Reinforced Masonry	None	None	None	None
	Tilt-up Structures	None	None	None	None
	Non-ductile Concrete Structures	None	None	None	None
Facilities	Bridge Failures	None	None	42	42

CHAPTER 8

THE LOMA PRIETA EARTHQUAKE: IMPORTANT COMPARISONS FOR THE CITY OF VENTURA

Revisions to the Final EIR in Response to Comments on the Draft

Comments on the Draft EIR concerning this chapter were primarily directed to questioning the similarity between the magnitude of the Loma Prieta earthquake and anticipated earthquakes in Ventura. Some commentors questioned the applicability of the data collected in Watsonville, Salinas, Santa Cruz, and Hollister to conditions in Ventura. As explained in the following chapter, the composition of the building inventory in Ventura and conditions in these other cities are broadly comparable; the structures are similar in age, building configuration, and inventory size. Soil amplification problems were particularly acute in Santa Cruz and less significant in Watsonville; for this reason, more emphasis was placed on collecting comparative data from Watsonville since amplification conditions in Watsonville more closely resemble what is expected in Ventura. The socio-economic and business conditions in Watsonville were also similar to conditions in Ventura.

The Richter Magnitude of the Loma Prieta was less than the magnitude of the 1857 San Andreas earthquake and less than the projected earthquake on the Pitas Point-Ventura that was simulated in the Seismic Risk Model. Therefore, compared to both historic San Andreas earthquakes and projected future worst case conditions, the Loma Prieta earthquake was a less intense earthquake than prior historic earthquakes on the San Andreas and the model conditions predicted in chapter 7.

However, Richter Magnitudes are not the only consideration that need to be weighed in determining the suitability of the Loma Prieta as a model for future conditions in Ventura if a moderate to strong quake occurs. As discussed and illustrated in a prior chapter (pages 6-8 through 6-12, **Table 6-2** and **Figure 6-2**), the local expression of earthquake intensity reflected in the MMI scale and related measurements of ground acceleration also provide important measures of the comparability of earthquakes. Because there are many levels of ground shaking generated locally by an earthquake, the MMI scale is an appropriate measure of shaking intensity. In addition, ground accelerations alone are also not suitable predictors of building damage since the duration of shaking (rather than maximum acceleration) often is a more significant determinant of damage than acceleration alone. Keeping all of these caveats in mind, it is possible to judge the degree of similarity of the Loma Prieta to future quakes in Ventura. John Kariotis, who provided the original **Level I and II** ordinance proposals for the City, specifically addressed the issue of the comparability of the Loma Prieta and future movements in Ventura (see Section 8.6 of the EIR). Based on this engineering review, **it is clear that the range of ground accelerations predicted for Ventura are within or less than the range of accelerations recorded for Loma Prieta**. Therefore, **based on comparability of Richter Magnitudes and ground accelerations documented by Kariotis, it is reasonable to conclude the experiences of Watsonville and Santa Cruz are directly comparable to future conditions modelled for Ventura.**

A second related group of comments were directed at the analysis of the performance of partially strengthened buildings. In response to this concern, an additional section has been included at the end of the chapter (Section 8.7, Building Damage in Strengthened Buildings: Additional Review). Based on this reevaluation, the original conclusions in the EIR--that strengthened buildings consistently outperformed unstrengthened buildings--was substantiated. Finally, a new section 8.8 has been added to this chapter which contains a brief review of the recent Sierra Madre Earthquake and the performance of both strengthened and unstrengthened buildings during this event.

8.1 Introduction

In addition to the Seismic Risk Model described in the preceding chapter, another source of valuable information about how the City of Ventura's inventory of unreinforced buildings may respond to a strong earthquake is provided by comparative data generated as a result of studies done subsequent to the 1989

Loma Prieta Earthquake. The following chapter incorporates studies conducted by Planning Corporation staff, Rutherford and Chekene (assisted by a National Science Foundation Grant), staff of the City of Watsonville Planning, Fire, and Building Departments, and John Kariotis, author of the proposed City of Ventura **Level I and II** ordinance standards. This chapter provides an important overview of some of the consequences of a moderately strong earthquake that were not directly addressed in the Seismic Risk Model. In addition, this information serves as a cross check (based on empirical data) of the computer simulation generated by Rutherford and Chekene.

8.2 The Loma Prieta Quake: A Model For the Impacts of an Earthquake on the City of Ventura

On Tuesday, October 17, 1989, the massive San Andreas fault moved in response to an adjustment in the deep geology of the Pacific plates which shape and define the North American continent. Along the surface of the ground emanating from where the fault shifted, seismic waves pulsed across the landscape for over 20 seconds, passing a wave of accelerated shock north and south, west and east. In places where these seismic waves encountered water saturated and unconsolidated soils, the movement of the ground was amplified producing radical shaking of building structures, somewhat like the amplified earthquake waves that destroyed buildings in Mexico City hundreds of miles from that quake's epicenter.

As of early 1990, damage estimates generated by agencies responsible for reconstruction after the Loma Prieta quake have exceeded $10 billion; $2 billion in losses were experienced in San Francisco alone. Santa Cruz officials estimate that damage to that County will exceed $1 billion. Areas outside of Santa Cruz, including the towns of Watsonville, Hollister, and Los Gatos, also suffered heavy damage and extensive housing dislocation. Much of the building destruction in these communities occurred to either unreinforced masonry structures or older frame homes not anchored to their foundations.

Approximately 65 people died in the first hour after the quake, a remarkably low number given the time and size of the earthquake. Most casualties were caused by the collapse of the Cypress Street section of Interstate 880 in San Francisco. At least 3,000 people were reported injured and over 10,000 were still homeless or are residing in temporary housing three months after the quake. Thousands of homes were damaged and around 500 were destroyed. Over 2,000 other buildings were damaged or destroyed.

The epicenter of this Richter magnitude 7.1 earthquake was located about 10 miles northeast of Santa Cruz along a segment of the San Andreas Fault, near Loma Prieta in the Santa Cruz Mountains. The focal depth has been placed at 9.5 miles. This is unusually deep, as typical California earthquake focal depths are only 4 to 6 miles below the surface. A magnitude 5.2 after shock occurred approximately 2.5 minutes after the main shock, and thousands of aftershocks have been recorded since the quake. In the week following the earthquake, a total of 300 aftershocks of magnitude 2.5 or greater with 20 aftershocks exceeding a 4.0 Richter magnitude. Many of these aftershocks contributed to the damage that occurred to unreinforced buildings. The aftershock zone spanned a 25 mile area between Los Gatos near Highway 17 south to Watsonville near Highway 101. This zone corresponds with the area of greatest structural damage. The aftershock zone ranged from about 2 to 9 miles in depth and corresponds roughly to the length of the rupture associated with the main shock.

Surface Effects and Historical Seismicity

Surface displacements with offsets of up to 3 or 4 feet along a zone about 20 miles long would normally be expected to accompany an earthquake of this magnitude. Unexpectedly, many fissures and fault traces were found over several discontinuous and indistinct zones; this surface expression was unusual. There are several possible explanations for this situation. The earthquake was unusually deep, making it difficult for the bedrock rupture to propagate to the ground surface. The combination of rugged topography, thick soil, and forest cover also probably made the surface breaks less distinct. The State Commission report on the 1906 earthquake described very similar surface rupture characteristics along the Santa Cruz Mountain portion of the San Andreas Fault.

The San Andreas Fault trends northwesterly and extends more than 800 miles from the Gulf of California to Cape Mendocino north of San Francisco. It has been the source of many large earthquakes, including an 1838 earthquake located on the peninsula south of San Francisco (magnitude in excess of 7.0), an 1865 earthquake northeast of Santa Cruz, and the 1906 San Francisco Earthquake with an estimated magnitude of 8.3.

The Loma Prieta earthquake essentially repeated the 1865 event and represents the first major rupture along the northern segment of the San Andreas Fault since 1906. The length of the fault rupture generally extended from the southern end of the 1906 break and thus relieved accumulating strain which had accumulated since the last movement. The lack of recent activity on this section of the fault and the occurrence of several magnitude 5.0 + events in the region over the last two years prompted a prediction of a major quake along this fault segment. **A similar major movement along the southern extension of the San Andreas in southern California is predicted to occur in the reasonably foreseeable future.**

Ground Motion Records

During the Loma Prieta quake, strong ground motion records were obtained from hundreds of instruments which enable a detailed understanding of ground motion throughout the region. **Preliminary results indicated that peak ground shaking as strong as 0.65g (where g is the acceleration due to gravity) were recorded in the epicentral area. Relatively low accelerations were recorded in locations between the epicenter and Oakland and San Francisco; accelerations between 0.20g and 0.33g were recorded along the Bay perimeter and in the San Francisco and Oakland areas. The stronger ground motions at these distant locations reflect the contribution of fill or weak soils to shaking intensity. The City of Ventura has comparable soil conditions to Watsonville and Santa Cruz: the older portions of both cities were constructed within or near floodplains which have soils subject to amplification.**

Soils

Surveys of liquefaction prone soils in the earthquake area (liquefaction is a phenomenon in which sand saturated with groundwater temporarily looses bearing strength when strongly shaken) revealed that the most heavily impacted locations were along the margins of San Francisco and Oakland and **along the flood plains of the Pajaro and Salinas Rivers east and south of Santa Cruz. Similar soil structures are present in Ventura in the Downtown Community.** Liquefaction and amplification effects were experienced in the heavily damaged Marina district of San Francisco. The runway at Oakland airport, bridges along the Pajaro and Salinas Rivers, and the State University of California Marine Station at Moss Landing were all damaged by liquefaction or amplification related effects. Soil amplification effects incorporated into the Seismic Risk Model predictions are discussed in Chapter 6.

The earthquake caused thousands of landslides along steep slopes, from hills in the epicentral area to at least as far north as the Pacific Coast just south of San Francisco. Several residential developments in the Santa Cruz Mountains were badly damaged by these slides. On Highway 17, two lanes were blocked west of the summit by a large slide. Large fissures opened in roadways throughout the Bay Area due to settlement and/or lurching.

8.3 The Comparative Data Base: Socio-Economic Effects of the Loma Prieta Quake

Before discussing the physical impacts of the quake on unreinforced and unanchored buildings, the following introduction to the socio-economic milieu is provided to enable an understanding of the context of the quake and its consequences for a City such as Ventura. This description is intended to provide a brief sketch of the social and economic consequences of an earthquake based on field observations made by the consultant during fieldwork in the earthquake zone in Watsonville about a week after the quake. Chapter 9 of the EIR reviews other socio-economic effects and describes the quake impacts in a more academic context.

> *The historic downtown portion of the City of Watsonville is arranged around a central one block square City park which contains a classically proportioned stone gazebo, deeply recessed paths lined*

with stone, well watered turf areas and mature specimen trees. The tree cover canopy shades clusters of Hispanic men, talking. Facing the park, historic structures constructed between 1880 and 1930 define the edges of the park around its entire perimeter. Many of the structures facing the park are constructed of brick masonry; all are elaborately detailed either with decorative cornices, buttresses, pediments, towers, or roof elements that were common in the 19th century. All of the buildings appear well maintained and in use, dominantly for retail businesses. Many of the buildings surrounding the park and streets radiating out into adjacent residential neighborhoods were damaged by the Loma Prieta earthquake, some severely.

Cordoning plastic ribbons with "caution" stamped repeatedly along their length, wind down one block and around another and police are stationed at every intersection to prevent vehicles or pedestrians from moving through the downtown streets. Hundreds of businesses, offices, and residences are in a state of suspended animation. On several facades, demolition notices have already been posted - nearly every structure is pinned with warning flyers reflecting the quakes' severity and the response of structures. The entire downtown resembles the silence of an urban streetscape on a Hollywood movie lot.

The downtown core is vacant on a clear, moderate day which, prior to the earthquake, would have been a day of refreshment and activity. Watsonville's downtown historic district is the business core of the City - and, it is a City of residents, moderate income residents primarily. Not a destination tourist resort, the downtown is both the social and economic center of this small sized City. Now, nearly two weeks after the Loma Prieta quake, on the perimeter of the downtown, through traffic diverted from the bridge closure along Highway 1 meanders impatiently through the Victorian neighborhoods on the south side of the business center. The neighborhood residents and rural residents from surrounding agricultural areas cluster around the Red Cross distribution centers and wait patiently in line at earthquake relief agencies established by both local and federal administrations. The homeless who evacuated their damaged homes are erecting tents in a gently sloping parkland one block from the City center.

The interludes between aftershocks are finally becoming lengthy and the duration and severity of these smaller, seismic pulses are converted into metaphor in the local paper. The Register-Pajaronian (Watsonville is near the Pajaro River which now flows unseasonably rapidly as a consequence of the earthquake) has a Sunday headline that inverts the real damage to the community with reality: "Businesses Fear Economic Aftershocks".

Obviously, with the magnitude of damage just beginning to be assessed, it is difficult to predict how extensive the socioeconomic displacement will be. But, if the Whittier quake is any example, two years later, reconstruction is only partial. Major tenants have already begun relocating to outlying, newer commercial areas outside the City center.

Clusters of young hard hatted engineers and building inspectors have voluntarily come to evaluate, inspect, and judge the damage. Major consequences. The list of structures to be demolished increases daily. There are rumors that historic preservationists will be arriving within a week to render second opinions. Some business and building owners express concern that they are being intimidated to make decisions rapidly. The City is encouraging the demolition of damaged buildings. But, in the interim, the decision-making continues. Entire segments of the City along the perimeter of the park will be demolished and, to alleviate the apparent economic paralysis, the demolition is scheduled to begin in a day or two. The building inspectors will determine how severe the economic dislocations will be.

The Freemasons have been given several hours to remove their prop-like ritual settings. Combining the efforts of the lodge members and their sons and grandsons, a human chain passes beaverskin stovepipe hats, braids, small wooden pedestals, shaker-like chairs and boxes of badges and leaflets. The younger men carry a barren wood throne with inexpensive velvet applique to a waiting longbed truck. The older Masons have a furtive, almost embarrassed air as they shift their interiors to storage.

Beyond the cordon, there is nearly a festive ambiance at the comer short order stand with a line of patrons in an adjacent parking lot doing business in the open air because their businesses have been locked out of damaged buildings. I asked the Fire Marshall overseeing the evacuation of the Freemason's building interior how extensive the damage was because the exterior of the building has an intact parapet and no obvious cracks threading along the walls. "On the backside of the building, there is a one-foot separation where the rear wall separated - you can see the sunlight coming in the roof" he explains. The movement of the wall pulled the floor joists supporting the second floor free from the wall. The Masons will not be allowed to salvage the second floor. In less than an hour, the Marshall will hammer the demolition tag on the door and within two days, the lot may be empty. The Masonic lodge has Persian influenced window shapes reminiscent of an early John Maybeck building.

The severity of these problems is acute; even five months after the earthquake, the homelessness and housing problems were only partially resolved and the downtown area has been virtually abandoned as an important business and cultural center. **The major socio-economic effects resulting from the earthquake are suggested in these brief observations. Anticipated effects include:**

- **The establishment of homeless encampments in public parks;**
- **The closure of contiguous blocks of central retail area;**
- **The displacement of tenants and the relocation of commercial tenants, to outlying, newer commercial areas;**
- **The establishment of relief centers;**
- **Continuous traffic congestion related to street closures and disruption of through traffic and downtown circulation; and**
- **The demolition of a large number of structures.**

8.4 The Performance of Unreinforced Masonry Buildings in the Loma Prieta Quake

The Loma Prieta Earthquake and its subsequent aftershocks resulted in widespread damage to a variety of commercial structures. A large geographical area was affected, as is typical for an earthquake of this magnitude. The affected area encompasses eight counties from Monterey and San Benito in the south to San Francisco, Alameda, and Contra Costa in the north. In total, building structures experienced damage over an area of approximately 3,000 square miles.

Although the damage was widespread, it was also quite sporadic. As expected, areas closest to the epicenter including Hollister, Los Gatos, Santa Cruz, and Watsonville experienced the most concentrated damage. Farther away, heavy damage was generally limited to buildings of very poor construction erected on soft soils that failed or amplified the earthquake ground motions.

Earthquake effects also tended to be highly directional. Most damage occurred within a narrow band that extends northwest to southeast, approximately paralleling the San Andreas Fault. Thus, many communities along the margins of San Francisco Bay escaped serious damage.

As seismologists have observed in past California earthquakes, the most concentrated and severe damage to building structures occurred in unreinforced masonry bearing-wall buildings. These structures, usually constructed of wood-frame roof and floor systems supported by thick unreinforced brick walls, were commonly constructed throughout California until the 1930s, when the adoption of building codes with seismic-resistive provisions prevented their further development. As a result, unreinforced buildings are typically found in the central business districts of nearly all older California cities. **Failures of unreinforced buildings resulted from inadequate anchorage of the masonry walls to roof and floor diaphragms, from**

stresses on the limited strength and ductility of the basic building materials, and from poor construction workmanship. Deterioration of the sandlime mortar and wood framing due to weather exposure frequently contributed to poor performance during an earthquake. In a preceding section of the EIR, more detailed information is provided about patterns of building failure.

Damage to unreinforced buildings in the Loma Prieta Earthquake ranged from dramatic collapses in Watsonville and Santa Cruz near the epicenter to fallen parapets in Martinez. Life-threatening collapses also occurred in Hollister, Los Gatos, Oakland, and the San Francisco financial district. The roofs and floors in many buildings with collapsed walls seemingly defied gravity by continuing to stand after losing their load bearing support. Generally, buildings with through-wall anchorage to floor and roof framing performed better than buildings without this feature.

Most unreinforced buildings outside of the epicenter areas did not collapse or experience obvious substantial damage. However, field investigations documented that many of these structures have experienced extensive cracking of the masonry and were therefore weakened. If not repaired, some of these buildings are likely to fail in future earthquakes. A prior chapter of the EIR (Section 4.1) discusses both minor and major building damage effects in considerable detail.

Unreinforced buildings with more than three or four stories are generally constructed with steel frames to carry gravity loads. Masonry walls in these buildings were primarily provided for building closure and partitions and to add lateral shear resistance to the structure. These steel frame infill masonry buildings have generally performed better in past California earthquakes than the smaller bearing wall buildings. As a result of this situation, these types of masonry buildings were not included in California legislation addressing the unreinforced masonry hazard.

In the Loma Prieta Earthquake, several steel frame buildings with infill masonry walls performed quite poorly, although no collapses occurred. Several major structures of this type in San Francisco and Oakland experienced extensive damage including partial loss of the exterior masonry walls, shattering of interior clay tile partitions, and cracking and spalling of terra cotta veneers.

Building Damage Inventory: Unstrengthened Buildings

In their report on damage to unreinforced buildings related to the Loma Prieta quake, Rutherford and Chekene (1990) provided partial inventories of damage and repair (as of July 1990). This report provides a broad profile of building damage. In communities closest to the epicenter, this inventory demonstrates the extent damage clearly. In the City of Watsonville, of a total of 26 unreinforced buildings surveyed, 23 had sustained damage; 21 of these structures were damaged to the point that they had to be vacated and, as of mid-1990, over 7 had been demolished. The total number of buildings demolished has increased since publication of the Rutherford and Chekene report. **With a 34% demolition factor, the experience of this quake closely replicates the predictions of the model for similar levels of ground acceleration.**

Similarly, of the 35 unstrengthened buildings inventoried in Santa Cruz, 31 were damaged seriously and of this number, all but 4 had to be vacated. As of mid June, 1990, more than 17 of the unreinforced buildings in the inventory had been demolished (more than 60% of the total). **This difference in damage percentages is at least in part due to the effects of amplification along the flood plain in the City of Santa Cruz.**

The data from Hollister and San Francisco roughly parallels the experience of Watsonville. Of the 18 unreinforced buildings inventoried in Hollister, 16 were damaged, 9 were vacated and, as of June 1990, 6 had been demolished. In San Francisco, of the 1,962 unstrengthened buildings inventoried, 721 were damaged, 202 were vacated, and 5 had been demolished by mid 1990. **Even in areas where peak ground accelerations were relatively low (.20 to .30 g) in relation to maximum accelerations, damage was very extensive. Given these distances from the epicenter and the count of damaged buildings, the Seismic Risk Model may slightly underestimate damage from a moderate quake (such as a movement along the San Andreas). The damage percentages in the model were empirically closer to the simulations that took into account liquefaction potential in Ventura.**

Characteristic Failure Patterns in the Loma Prieta Quake

Detailed information about types of building failures were obtained for nearly 2000 buildings in San Francisco. Summarizing these damage patterns, it is obvious nearly all of the damage profiles explained in Chapter 4 of the EIR (section 4.1) were expressed in the San Francisco inventory. Total building damage counts were:

Type of Damage	Number of Affected Buildings
Falling Units or Trim	101
Veneer or Delamination Failure	98
Parapet Failure	99
Partial Wall Failure	61
Entire Wall Failure	36

Type of Cracking Damage	Number of Affected Buildings
Corner of Openings	252
"X" Cracking of Spandrels	124
Vertical Cracks at Spandrel Edges	179
"X" Cracks in Piers or Walls	204
Horizontal Cracks on Pier	199
Corner Distress at First Level	167
Corner Distress above First Level	167

Other Types of Damage	Number of Affected Buildings
Debris Damage: Adjacent Building	7
Roof/Floor Failure from Wall Movement	13

Building Damage Inventory: Strengthened Buildings

The Loma Prieta Quake provided limited opportunities to compare the reactions and performance of partially or completely strengthened buildings. However, some valuable data about the ability of reinforced buildings to withstand moderate ground accelerations was obtained. As in the case of unstrengthened buildings, damage factors were higher closer to the epicenter and in areas where soil amplification increased the penetration of ground waves into the structural systems of unreinforced buildings.

In Watsonville, two buildings had been partially strengthened. One of these structures was an historic building which had been upgraded with City assistance to approximately **Level I** standards. Both partially strengthened buildings were damaged, one severely enough to be vacated. Repairs and renovation are now underway on both partially strengthened buildings. In the City of Santa Cruz, of the 8 strengthened buildings (all upgraded to various standards but generally conforming to **Level I and partial Level II standards**), all eight were damaged, 6 to the point of needing to be vacated for a sustained period of time. Of the partially strengthened buildings, one had been demolished as of June 1990. Of the 68 strengthened buildings in San Francisco (where a more comprehensive upgrade requirement [SF Code Section 104f] has been in effect when a change of building occupancy occurs), only 7 were damaged, none were vacated and none demolished.

Other data about the effectiveness of strengthening programs has been assembled by Rutherford and Chekene (1990:29-30). In Hollister, two partially strengthened buildings were damaged, one apparently severely. Non-standard methods had been used in these upgrades. In Campbell, a building and warehouse upgraded to 1973 Uniform Building Code Standards were damaged slightly; the worst observed impact was

partial failure of a gable wall. In Los Gatos, an historic pumphouse had been upgraded to 1985 Uniform Building Code Standards and had the interior face of the unreinforced walls gunited; this structure suffered no damage.

Damage and Causation: A Summary of the Rutherford and Chekene Analysis

In attempting to explain what factors contributed to damage profiles of both unstrengthened and strengthened buildings, Rutherford and Chekene conducted extensive pair wise comparisons of attributes thought to be causal factors in encouraging or enhancing damage. The results were then tested for statistical significance. **Confirming the observations of a number of engineers and geologists, soil characteristics were determined to be the most influential variables governing damage rates. Further evaluation of the data revealed that buildings with taller than average heights also were damaged more extensively than smaller buildings. This statistically derived and tested conclusion also confirmed empirical observations.**

8.5 Residential Buildings in the Loma Prieta Quake

One of the unanticipated effects of the Loma Prieta quake that seriously affected the downtown business core in the City of Watsonville was the problem of homelessness generated as a result of damage to residential buildings that had not been anchored to their foundations. Similar to conditions in Ventura, Watsonville's downtown is surrounded by older frame houses constructed in the 1920s and 30s. These older buildings often lacked adequate attachment to their foundations which resulted in building movements that made many of these residences uninhabitable for days, and in many cases, for several months. A portion of the stock of affordable residential homes in Watsonville were lost as a result of demolition. During the initial weeks and months after the earthquake, large numbers of displaced persons established encampments in the main City parks and open spaces in the downtown area, a condition which further complicated demolition and earthquake recovery. For these reasons, a review of the effects of Loma Prieta on residential buildings is also provided.

Typical Damage Profile

Most residential buildings in the epicenter zone and surrounding areas were fabricated with wood frame construction techniques. Such buildings have generally performed well in past earthquakes because such structures minimize inertial forces and because they are relatively rigid, minimizing damage associated with deformation, such as cracking of interior walls. There are, however, major exceptions to this generally good performance record:

- Older (especially pre-1940s) homes, because they lack positive connections to their foundations or have raised floors supported by relatively weak cripple walls, were displaced from their foundations.

- Some of the more irregularly shaped newer homes, because they lacked clear load paths due to complex geometry or were built without enough wall area to resist the seismic forces, also performed poorly.

- Multi-story apartment buildings or houses with garages on the ground floor, where garage doors have replaced most solid walls, were also prone to failure.

Except for areas of poor soils (soft, saturated sands and silts), which experienced severe damage as far away as San Francisco, damage to residences was generally limited to the epicentral areas of Watsonville, Santa Cruz, and Los Gatos.

Residential building damage in the epicentral area was widespread and considerable, although most newer houses performed very well. Many buildings with wood-lath-and-plaster walls suffered severe interior non-structural damage; damage to gypsum board interior walls appeared to be significantly less severe. Chimney

damage ranging from cracking to twisting and collapse was observed throughout the epicentral area. Such damage was observed in as many as 30% to 40% of the homes in the older areas of Watsonville. Chimney damage in Santa Cruz was less frequent and was primarily limited to older, unreinforced chimneys.

Severe structural damage to homes observed could mainly be attributed to failure of unbraced cripple walls and lack of sill anchorage. These cripple walls are short wood stud framing present between the foundation and first floor of the building. Because they are not sheathed with plaster, as are walls in the living area, they are substantially weaker and a common location for failures.

Watsonville and Santa Cruz

Such damage was mainly observed in pre-1940s homes with horizontal wood sheathing. These homes moved laterally from several inches to a foot, until the cripple walls became unstable and collapsed. Damaged to utility lines due to this motion was frequent. In Watsonville, cripple wall failures were observed in approximately 10% to 20% of the pre-1940s residences throughout the area, with many blocks suffering close to 100% failures. In Santa Cruz, damage appeared to occur mainly in the area of poorer soils. Nearly all of the homes on Pacific Avenue south of the Pacific Garden Mall had cripple wall failures.

Severe damage was also apparent on Myrtle Street, near the wastewater treatment plant at Neary Lagoon. On one block, five of twenty-five homes had cripple wall failures. On this street, correlation of damage with quality of maintenance and general pre-earthquake condition was evident. Apparently, older homes that had been restored architecturally often also had structural upgrades. In one Watsonville block, only one house did not fall from its foundations. It had just been seismically upgraded and had a new foundation without cripples. Its interior also had no damage, not even sheetrock cracking.

San Francisco

The most severely damaged area in San Francisco was the Marina district. The soils in this area consist mainly of soft, saturated sands and silts, some of which are naturally occurring, but most of which were filled in for the Panama-Pacific Exposition circa 1915.

8.6 Recommended Revisions to the Previously Proposed Ventura Ordinance Based on the Loma Prieta Experience

At the request of the Planning Corporation, Kariotis and Associates, the principal authors of the proposed City of Ventura Ordinance, investigated earthquake damaged structures in several cities in Northern California including Salinas, Gilroy, Watsonville, Hollister, Los Gatos, Santa Cruz, Mission San Jose, San Francisco, Palo Alto, and Oakland. Based on these observations, Kariotis was asked to suggest changes to the Ventura ordinance. Portions of the following section was prepared in response to this request.

Peak Accelerations and Design Issues

Ground accelerations are a product of the strength of an earthquake, the distance of a measured location from the epicenter, and the site specific soil conditions at the point of measurement. **The accelerations predicted for the City of Ventura modelled in the Pitas Point Fault movement simulation ranged from about .45g to .60g while the San Andreas simulation values ranged from about .11g to about .22g.** Actual measured ground accelerations during the Loma Prieta quake varied predominantly based on distance from the epicenter and soil conditions. **The actual intensity of ground shaking during the Loma Prieta ranged from over 50 percent of gravity (.50 g) near Santa Cruz and Los Gatos to slightly over 10 percent (.1 g) of gravity in Salinas and the vicinity of Mission San Jose.**

In responding to the Planning Corporation request, several hundred unreinforced masonry buildings were visually inspected by Kariotis and more than 50 structures were examined in detail. The buildings investigated in detail sustained damage that ranged from partial collapse to only parapet damage or minor

cracking. These buildings represented the damage spectrum encountered throughout the earthquake area and, to the degree feasible, different damage estimates were correlated with ground acceleration values.

The quality of masonry in the buildings inspected varied from very poor to excellent. Many of the buildings had wall anchors which had either been installed during original construction or were added after the 1906 San Francisco earthquake. Buildings in all of the cities inspected had reported damage to unreinforced masonry buildings in the 1906 earthquake. Nearly all of the buildings surveyed in Salinas were constructed prior to 1906. Wall anchors at the roof level was the commonly observed strengthening after the 1906 earthquake.

Recently strengthened unreinforced buildings were also surveyed in both Watsonville and Salinas. The strengthening observed in these two cities did not fully conform to the proposed requirements for the San Buenaventura Ordinance. An unreinforced building in Gilroy was equipped with instruments designed to record the building's response to the ground shaking. The original construction of the Gilroy Building nearly conformed to the requirements of the proposed San Buenaventura Ordinance. The City of Salinas provided a record of the earthquake damage to an unreinforced masonry building caused by a recorded intensity of about one half of the intensity predicted for San Buenaventura. The recorded components of the earthquake intensity were 12 and 9 percent of gravity. The recorder was within two blocks of the City Center. Ground motions were recorded on two components at 90 degrees to each other. The probable maximum intensity was about 15 percent (.15g) of gravity.

Comparative Damage Observations

Salinas

With ground accelerations of about one half those anticipated in Ventura with a movement on the San Andreas, the observed damage in the older, central portion of Salinas was limited to the collapse of parapets that exceeded a height/thickness ratio of 3 to 4 and cracking at the points of intersection of unreinforced walls. Parapet collapse and damage was most common in structures with deteriorated or poorer quality brick. Damage to interior plastered partitioning was slight. Evidence of the existence of wall anchors installed at the time of building construction was common; anchors installed after the original construction had been completed were also observed in some structures in Salinas.

One strengthened unreinforced building was surveyed in Salinas. A steel moment frame designed for slightly more resistance than recommended for San Buenaventura had been installed in the first story of a structure with an open street front. Existing and new wall anchors were evident in most walls. No earthquake damage was discovered in the inspection of the strengthened building. All other unreinforced buildings in Salinas did not have any strengthening at the street front and the lack of such strengthening did not contribute to earthquake damage. Glass breakage along the street facades in Salinas rarely occurred.

Oakland and Hollister

The Cities of Oakland and Hollister were shaken by recorded intensities that were slightly above the intensities predicted for San Buenaventura assuming an event on the San Andreas Fault. Collapse of unanchored brick walls and parapets was observed in both of these cities. Glass breakage at street fronts was also more common than in Salinas. In-plane damage to rear walls of open front two-story buildings was also observed in Hollister. In-plane damage to unreinforced buildings in Oakland was not common but was observed in the upper story of a large industrial building. **Several multistory unreinforced buildings in Oakland that were strengthened in conformance with the general guidelines of the Los Angeles City ordinance (more than Level II but less than Level III) were undamaged.**

Palo Alto

The City of Palo Alto has an ordinance similar to the upgrading requirements adopted by the City of Los Angeles. Several strengthened buildings were undamaged. **The recorded local intensity of ground**

acceleration in Palo Alto was slightly less than that predicted for San Buenaventura. The Stanford University buildings in Palo Alto are more massive than the commercial buildings of San Buenaventura. In-plane damage and damage to interior partitioning and ceilings was common in the unstrengthened buildings on the Stanford Campus. Buildings on the Stanford campus that were strengthened by use of standards in excess of those required by the Los Angeles City ordinance were undamaged.

Gilroy, Watsonville, Santa Cruz, and Los Gatos

The Cities of Gilroy, Watsonville, Santa Cruz, and Los Gatos were shaken by intensities equal to and above those predicted for San Buenaventura. Worst case accelerations were about equal to model outputs predicting the effects of movement on the Pitas Point-Ventura Fault. Gilroy had the least earthquake damage. The observed damage was to brick parapets and walls at the upper stories. Glass breakage at street fronts also occurred. An instrumented building in Gilroy was shaken by the intensity of ground shaking predicted for San Buenaventura during a moderately strong quake. The building does not appear to be recently strengthened but the walls are well anchored and the 40 x 60 foot two-story building has cross walls in both stories. The building has brick shear walls on all sides. The previously proposed ordinance for San Buenaventura would require the anchorage that was visible in this structure.

The cities of Watsonville, Santa Cruz, and Los Gatos were shaken by higher intensities than the other cities inspected during post earthquake surveys. The recorded intensities exceeded 50 percent of gravity (.5 g). Nearly all unanchored brick walls fell away from the buildings in these cities. Parapet damage was common and caused loss of life. Damage to windows at the street front occurred in less than 50 percent of the buildings. Evidence of battering of buildings on the street front was observed in isolated cases but did not contribute to life safety hazards. Damage to walls that were common to two buildings was not observed. In-plane damage to rear walls of open front buildings occurred in about one-half of the brick masonry buildings. The in-plane damage was not of the degree that collapse was imminent or even probable. Damage to plaster ceiling and interior partitioning was not general, in fact, generally damage was not observed. The stiffness and strength of partitions and diaphragms is likely understated by code allowable strength values for existing materials.

The principal deficiencies that contributed to the observed damage to unreinforced masonry buildings in Watsonville, Santa Cruz, and Los Gatos were unbraced parapets, lack of wall anchorage, excessive height/thickness ratios at upper stories, and lack of a shear connection of the diaphragm to the shear walls. Absence of wall anchors and parapet bracing was the major contributor to damage and life safety threats. Lack of a shear connection of the diaphragm to the shear wall caused splitting of the brick walls at the upper stories. These walls generally collapsed even if anchored.

A strengthened unreinforced building in Watsonville had wall damage due to out-of-plane movement due to an excessive height/thickness ratio. This building did not have a shear connection of the strengthened diaphragms to the shear walls. Vertical splitting of the building corners was observed due to relative diaphragm movement. The open front of the building had been partially infilled with reinforced masonry. This strengthening was adequate to control the relative displacement. The rear wall had many openings and had in-plane damage in the first and second stories. In-plane damage was common in brick walls with many openings in all of these cities. However, in-plane damage did not occur in some substantial multistory buildings that had good quality brick masonry. The relationship of in-plane damage to the brick walls and the estimated quality of the masonry was very evident.

Predicted Damage Reductions with Strengthening

The benefits of the previously proposed ordinance of San Buenaventura to reduce the damage observed in the cities shaken by intensities greater than predicted for San Buenaventura were obvious. Kariotis predicted that anchorage of unreinforced walls and parapet bracing (**a Level I upgrade**) would have reduced the observed damage by 75 to 90 percent in many cases.

A shear connection of the existing diaphragms to the shear walls would have eliminated the cracking and damage to the intersections of brick walls. If the height/thickness ratio of the brick walls would have conformed to the allowable ratio of the intensity zone, collapse of anchored walls would be unlikely. In-plane damage to existing brick buildings was observed when the intensity of ground shaking exceeded 20 percent (.2g) of gravity. Analysis of the single brick wall that provides the total lateral resistance of the existing buildings appears to be warranted. The benefits of providing a lateral load resisting element in the open front cannot be clearly indicated even when the intensity of recorded ground motion approaches 30 percent of gravity. Damage surveys of Brawley, El Centro, and Calexico after the 1979 Imperial County earthquake confirms this observation. Breakage of street front windows appear to be the commonly observed damage related to the lack of seismic resistance at the street front. Damage to glazing in Oakland and Palo Alto, was uncommon and nearly nonexistent in Salinas. Damage to street front windows was observed in Hollister and Gilroy but occurred in less than 25 percent of the street fronts of the commercial buildings.

Ordinance Modifications

The previously proposed ordinance for San Buenaventura includes five potential strengthening activities:

1. providing for the stability of parapets and walls;
2. anchoring and bracing parapets and walls;
3. evaluating buildings with discontinuous diaphragms and providing some strengthening as needed if deficiencies exist;
4. Analysis and improvement of the existing system to control lateral displacement of open fronts; and
5. Analysis of and upgrading of shear walls that are parallel to open fronts to provide total lateral resistance in one direction of ground shaking.

The need for strengthening activities 1 and 2 was found to be critical. These strengthening elements provide the maximum benefit to reduce earthquake damage even when the ground shaking is of the intensity of about twice of that predicted for San Buenaventura.

Upgrade activity 3 would be applicable for specific cases that will rarely occur. Unreinforced buildings with this deficiency were not found in the Northern California surveys and its **inclusion in the previously proposed ordinance does not have a significant impact on costs.**

In Kariotis' judgement, strengthening activity 4 has only limited benefits for the City of Ventura. The seismicity report prepared by ERTEC has been challenged as nonconservative and under-representative of future hazard levels. If this criticism is valid, **the consistent application of activity 4 will have a significant benefit for reducing the probable loss of occupancy for the post-earthquake damage evaluation period.**

Strengthening activity 5 would only be applicable to a small selection of buildings with open store front and inadequate shear capacity in a parallel rear entrance wall. For this reason, this activity would have a limited effect on upgrade costs for most buildings and this activity will probably not be required except in a few critical cases. Moreover, since this deficiency in the rear walls of unreinforced buildings is unrelated to maintaining openings for retail pedestrian traffic, the deficiency can generally be remedied by infilling existing openings.

Recommended Modifications

The only modification that may feasibly be implemented to the current ordinance that was suggested by the post earthquake field observations concerns horizontal diaphragms. These diaphragms appear to be stiffer than determined by the dynamic testing program that was used as a basis for the proposed **Level I and II** ordinances. Recent analyses of diaphragms of instrumented buildings shaken by moderate intensity ground motions confirm the observed performance in this earthquake. The ceilings and roofing on diaphragms contribute a substantial increase in building stiffness beyond what was previously predicted.

The lack of damage to diaphragms in cities that were shaken by high intensities can possibly be attributed to the unloading of the diaphragm by the separation of unanchored walls and by the lack of a shear connection to the shear wall. On the basis of this information, According to Kariotis, Strengthening Activity 4 could potentially be deleted from the previously proposed ordinance without substantial concern. However, there is not unanimous agreement among the engineers retained by the consultant for preparation of the EIR that such a deletion is warranted.

8.7 Structural Damage in Strengthened Buildings: Additional Review

In comments on the EIR, several individuals argued that during the Loma Prieta quake, strengthened buildings performed less satisfactorily than unstrengthened buildings. Supporting data was extracted from the report "Final Report on Damage to Unreinforced Masonry Buildings in the Loma Prieta Earthquake" by Rutherford & Chekene; these data, however, were taken out of context. The building summaries in this report contain information for areas impacted by the quake with wide variations in soil amplification potential and variable distances from the earthquake epicenter. Many of the buildings reported as "strengthened" in the Rutherford and Chekene inventory were only partially strengthened, and not in accordance with any recognized standard. The reference which has generated some confusion over the general efficacy of strengthening (cited in comments by Harry Hibbs, 1991, Response to Comments section of this EIR) states:

> *In Santa Cruz, some strengthening to at least eight URM buildings had occurred previously although the level varied and strengthening was often incomplete.....These partially strengthened buildings were damaged and vacated at rates similar to the unstrengthened buildings, but a much higher percentage of unstrengthened buildings were demolished. The weighted average damage to these strengthened structures was 14%, also less than the 28% of the unstrengthened URM buildings.*

In the same report, data for buildings in San Francisco, which is a much more statistically valid data set than the gross summaries cited in the paragraph above, indicated an overall average damage ratio of 2.68% for unstrengthened buildings and 1.77% for strengthened buildings. Damage in strengthened buildings was almost all "light," where 139 unstrengthened buildings had "moderate," "heavy," or "severe" damage. **These data confirmed that strengthened buildings performed better than unstrengthened structures and damage percentages were lower for reinforced buildings in all cases where statistically significant sample of buildings was evaluated.**

A report on the Whittier earthquake of 1987 by the Los Angeles Department of Building and Safety also indicated improvement in performance by strengthened buildings. Thirty percent of unstrengthened buildings were reported in all damage categories, while only 20% of strengthened buildings reported damage. More severe damage which could cause temporary closure of the building occurred in 5.7% of unstrengthened buildings, but only in 2.1% of strengthened buildings.

The primary purpose of most unreinforced building strengthening is life safety. **There has never been a fatality reported in the literature in a building strengthened to a recognized standard.** The warehouse at 6th and Townsend in San Francisco where several deaths occurred during the Loma Prieta quake was not seismically strengthened. **While few retrofitted structures will perform as well as comparable new**

buildings, there is no evidence to suggest that strengthening will not improve performance and minimize death and injury.

Significant statistical analysis has been performed on Loma Prieta damage data from nearly 2,000 unreinforced buildings since the release of the Draft EIR. Several parameters used in the studies for both San Francisco and Ventura were confirmed by these analyses. First, the rough, initial calculation that strengthened buildings were less damaged than unstrengthened buildings was confirmed. Also, the observation that tall stories and soft soils increased damage was confirmed. Most importantly, the relative damageability of various unreinforced building types was confirmed; the order of damageability used in the San Francisco and Ventura studies, originally deduced from observation, theoretical dynamic response, and structural calculation, was confirmed precisely by Loma Prieta data.

The damage data were also analyzed to find the best statistical grouping of building prototypes, an important component of the Seismic Risk Model. This analysis suggested that four groups adequately described variability in building types whereas the Model included five prototypes; otherwise, the order of damageability observed as a result of post earthquake surveys was identical to the rankings used in the Seismic Risk Model. These data independently confirmed the validity of the Model. (Refer to chapter 14, Comments and Responses, for additional information and discussion regarding structural damage in strengthened buildings). **Consideration of these data confirmed both the efficacy of the Seismic Risk Model and the conclusions of the Draft EIR regarding the utility of strengthening in reducing building damage.**

8.8 Additional Comparative Data: The Sierra Madre Earthquake of June, 1991

The Sierra Madre Earthquake occurred on June 28, 1991 in the Transverse Range province under the San Gabriel Mountains, 7 miles north of the City of Monrovia in the vicinity of Mount Wilson, California. The Richter Magnitude of the quake was 5.8, a magnitude which, based on state-wide comparative data summarized in **Figure 6-2** (page 6-10), is sufficient to collapse parapets, initiate wall tie damage, and produce out of plane failure in a selection of buildings. The fault to which the quake was attributed is termed the Clamshell-Sawpit Fault which is rated as a potentially active fault. The duration of perceptible ground shaking was approximately 10 seconds and intense shaking was recorded for about 2 seconds. Recorded peak ground accelerations in the Pasadena area ranged from a maximum of 0.46g to about .20 g in downtown Pasadena.

Based on data discussed in this and other chapters of the EIR, a peak acceleration of 0.20g would only be sufficient to initiate relatively minor building failures. Because the peak accelerations were well below the levels used in current building codes and designs, as expected, little or no damage to modern structures occurred. Most damage caused by this earthquake was to ornamentation, veneer, chimneys, and large glass windows. Structural damage was confined to light, wood frame buildings and unreinforced masonry structures.

The damage profiles of unreinforced masonry buildings were typical of what was expected given the size and duration of the quake. The most common unreinforced masonry failure was partial or complete collapse of unanchored parapets. Due to the short duration of the quake, parapet failures were the dominant observed failure type; with a longer duration quake of this size, wall collapse would have been commonplace. In-plane shear failure (diagonal step fractures) were also commonly observed.

Of considerable interest concerning the topic of the performance of strengthened buildings in this earthquake, the initial report on the earthquake (Southern California Earthquake Bulletin No. 1, Southern California Earthquake Center, Governor's Office of Emergency Services, 1991:6) documented that strengthened buildings were essentially undamaged. Buildings that were damage included only structures that had not been strengthened to any recognized standard. The damage resulting from this quake was characterized as resulting from "the lack of connections of the walls to the roof and floor framing (anchorage) and to excessively tall parapets" (Richard Ranous, Engineering Aspects of the Sierra Madre Earthquake, ibid., page 6). Buildings strengthened to the UCBC Appendix Chapter 1 (**Level III** standards) "suffered little or no damage. What little damage there was to strengthened buildings will be easily repaired".

Building damage in the downtown central business district in the City of Watsonville was extensive. Entire blocks in the city center were damaged so severely that important local architectural heritage structures (such as the IOOF Building illustrated above) had to be demolished.

Fallen debris from collapsed parapets and outer wythes of brick cover the sidewalks along a central portion of the Watsonville business district. Closure of the entire business center of the City resulted from the earthquake. All pedestrian and vehicle traffic in the downtown core was prohibited for weeks after the earthquake resulting in substantial economic hardship for business owners and building tenants. Nearly a year after the earthquake, some businesses were still operating out of temporary mobile trailers and tents on the outskirts of the business district.

Buildings made of terra cotta tiles were among the most severely damaged structures in northern California cities. Masses of tile are shown in the foreground of this photograph. Due to the close proximity of unreinforced buildings and cement or frame structures, substantial damage occurred in some areas due to adjacency problems. Note the extreme height differences between adjacent buildings. In the background of this photograph, a large concrete tilt up building (Fords Department Store) also sustained such major damage that it had to be demolished. Of all of the buildings in this photograph, only two have not been demolished in the aftermath of the quake.

The primary source of fatalities in Watsonville and Santa Cruz resulted from collapsing walls or wall segments and parapets (illustrated here) and from the collapse of walls from higher buildings on adjacent smaller structures. One person was killed from a falling parapet at the entrance of the Bake-Rite Bakery Building illustrated in this picture. Note the large size of the ornamental decorative work that fell from the building facade.

Damage to the interior of commercial buildings in both Watsonville and Santa Cruz was very extensive. Damage to and loss of inventory was a particularly significant economic problem in Watsonville. This photograph illustrates the condition of a building interior in an appliance salesroom.

Residential buildings were also severely damaged in both Watsonville and Santa Cruz (as well as San Francisco). As a result, hundreds of homes immediately surrounding the downtown community in Watsonville had to be vacated during damage analysis and restoration. Several tent cities (such as the one shown here in Watsonville's main municipal park) were established as interim housing locations. Nearly six months after the earthquake, some of these tent communities were still in use.

Building damage to residential structures was very common throughout northern California, especially in the older residential communities surrounding the downtown core where most unreinforced buildings were located. Cripple wall failures, chimney collapses, foundation separation, and related structural damage was very common in both Watsonville and Santa Cruz. The damage to this home in Santa Cruz was exacerbated by liquefaction.

One of the most serious adverse economic consequences from the Loma Prieta earthquake on downtown areas in Watsonville, Salinas, Hollister, and Santa Cruz resulted from the need to close down all businesses in block long corridors during the demolition phase of recovery. The proximity of unreinforced and more recently constructed frame and stucco buildings is illustrated in this photograph of the Santa Cruz Pacific Mall. Note the extensive wall failure on the buildings in the center of this picture. The shoring is a temporary measure used during the structural evaluation period.

Building demolitions begin the reconstruction phase. During the six months to a year when building demolition was conducted in smaller northern California cities, major adverse economic effects were experienced in many communities. Most of the Pacific Mall in Santa Cruz and nearly all of the Watsonville downtown business core ceased to function as economic entities for months following the earthquake. Illustrated above are the typical consequences of earthquakes on communities with unreinforced buildings in their business core: closure, heavy equipment operations, demolition activites, and business abandonment.

CHAPTER 9

CULTURAL AND VISUAL RESOURCES: SPECIAL CONSIDERATIONS FOR REINFORCEMENT TECHNOLOGY

Revisions to the Final EIR in Response to Comments on the Draft

Relatively few comments were received on the Cultural Resource chapter of the Draft EIR which indicates general concurrence with the findings and mitigation recommendations contained in this chapter. The City of Ventura Historic Preservation Commission encouraged the inclusion of ten additional buildings on the list of historic structures recommended for **Level III** reinforcement. City staff inquired about the applicability of the Mills Act to buildings included in the City's unreinforced building inventory. Because the tax incentives derived from the Mills Act are most applicable to buildings with relatively high tax liabilities, it was necessary to determine how many building owners would potentially benefit from participation in this program. Using tax data available from the County Assessor and economic information contained in Chapter 11, a list of buildings that would benefit from this program was compiled. More than 45% of the present building ownerships would potentially benefit from a Mills Act program.

9.1 Introduction

Depending on which form of strengthening ordinance is adopted, two important aspects of community aesthetics in the Downtown vicinity and surrounding areas may be altered: (1) the current visual quality of the streetscape, and (2) the cultural and architectural significance of some important structures. Several of the options considered could result in adverse consequences on the historic fabric and scenic quality of the streetscape, particularly in areas where the inventory of unreinforced structures is high. However, if no ordinance is adopted, it is likely that much of the historic unreinforced masonry building stock in the City would be seriously reduced by a moderate to strong quake. Moreover, if an ordinance is adopted that is not sufficiently protective, a significant number of structures could be lost as a result of post-earthquake demolitions. A third potential source of impact to cultural resources is related to the foundation structural work that may necessitate excavation into historic or prehistoric archaeological deposits to facilitate strengthening. Each of these sources of impact are considered in the following section.

9.2 Existing Federal, State, and City Policies and Regulations for Protection and Preservation of Historic Archaeological Resources and Standing Structures

Because processes of natural erosion and development activity are constantly reducing the number and altering the condition of historic archaeological sites and historic architectural resources, these sites and buildings, which are a unique record of both history and community aesthetics, can only decrease in quantity over time. Only protection of a sample of remaining historic cultural and architectural sites will insure that even a small proportion of the original number of unique sites and structures that exist in Ventura will be preserved.

Federal statutes require that cultural resources to be impacted by a Federally permitted or funded project should be evaluated (and protected when possible). The National Environmental Policy Act (NEPA) (Public Law 91-190; 91 Stat 852), Executive Order 11593, Section 106 of the National Historic Preservation Act of 1966 (Public Law 89-665; 80 Stat 915), and the Archaeological and Historical Preservation Act of 1974 (Public Law 93-291; 88 Stat 174) all set forth basic planning and heritage protection procedures, most of which have been codified into the California Environmental Quality Act. State legislation which protects cultural resources (regardless of the source of funding) includes Section 21001 of the California Environmental Quality Act, Section 27402 of the Coastal Zone Conservation Act of 1972, California Senate Concurrent Resolution No. 43, Chapter 87, the California Health and Safety Code, Section 8100, and Chapter 1.75 beginning with Section 5097.9 of Division 5 of the Public Resources Code. **If Federal or State funds are used to sponsor strengthening activities on significant historic structures, compliance with both Federal and State cultural resource policies is required.**

Historic resources within the City of Ventura are afforded some level of protection if they are found to be listed under one of the following categories: potential local landmark/district, local landmark/district; National Register of Historic Places; State Landmark or Point of Interest.

The City has declared 78 structures as landmarks and designated 3 neighborhoods as historic districts under an ordinance originally passed in 1973 that established the San Buenaventura Historic Preservation Commission (Article 4, Sec. 1340). This ordinance empowers the Commission to recommend potential landmarks to the City Council for final approval. The ordinance prohibits an owner from "demolishing, defacing, altering, adding to or otherwise changing a landmark without giving 180 days prior written notice to the City Clerk". Under certain conditions, such as extreme financial hardship or unsafe condition, the 180 days can be waived by the City Council. The present ordinance affords only 180 days protection to a landmark, giving those interested in preserving the landmark a chance to move the structure.

Properties listed or eligible for listing on the National Register are not protected by the local historic preservation ordinance unless they have been declared City Landmarks. The National Register Landmarks are protected by Section 106 of the National Historic Preservation Act, when any resource is potentially affected by an undertaking which involves federal funds, licenses, or permits. Because Federal and State funding may be used to upgrade historic structures, Federal procedures may apply to cultural resource mitigation programs in this case. For example, local governments that use federal funds for road improvements, water and sewer projects, or redevelopment or housing construction, must obtain a determination of eligibility for structures older than 50 years or archaeological sites. **Under Section 106, federal funds may not be used to alter or destroy a National Register eligible property unless the effects are considered. The review and consultation process involves the federal lead agency, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation. The use of Federal or State funds for strengthening activities contemplated under several versions of the proposed ordinance would require National Register determinations.**

Properties listed as State Landmarks or Points of Interest are afforded some protection under the California Environmental Quality Act (CEQA). If the designated property is potentially affected by any development action, a study of impacts and mitigation is required. In the City of Ventura there are currently two State Historic Landmarks. CEQA also applies to archaeological sites, and Section 21083.2 defines "uniqueness," which must be evaluated by professional investigation, usually on the basis of fairly substantial subsurface testing programs.

The remainder of potentially eligible historic structures not covered by the CEQA review process, if such structures include an archaeological component, would be protected by a City Ordinance (City Council Resolution 89-49). **This ordinance states that if review of when a building permit application indicates that construction is proposed at a site known to contain any objects "or artifacts of substantial historical and/or archaeological significance, dating from the pre-historic era through the end of the nineteenth century", then the application is deemed discretionary rather than ministerial. If archaeological deposits are present, then CEQA processing is required.**

The City Planning Division uses the Cultural Heritage Survey to provide information on potentially significant historic structures. For those portions of the City not covered by the survey, a site visit by staff is done to determine the potential for historic resources. If historic resources appear to exist, a report is funded by the applicant to define the historic significance of the property.

During the process of upgrading any structure, if human remains are discovered, they are protected under Section 7050.5 of the State Health and Safety Code, and Section 5097.94 of the Public Resources Code. In the event of such a discovery, work is to be halted in the vicinity or any nearby area reasonably expected to overlie adjacent remains. The County Coroner is to be notified promptly to determine whether the remains are Native American. If the Coroner finds that the remains are not subject to the authority of that office, he

or she is charged with notifying the Native American Heritage Commission, which will then identify and notify descendants of the deceased to arrange for the removal, study, and reburial of the individual(s).
The adopted Comprehensive Plan contains an H-Overlay Zone in the downtown area. This designation recognizes the importance of the downtown area as a heritage resource of special significance and indicates an interest in preserving the historical character and significance of the areas. Implementing the intents of this designation relies on CEQA review and the City's Historic Preservation Program.

The City Council adopted an Historic Preservation Policy and Plan prepared in 1979 that gave direction to the City Council and the Historic Preservation Commission regarding the policies, procedures, and activities related to historic preservation in Ventura. Additional commitments the City has demonstrated to preserving its past have included the establishment of a low interest revolving loan fund available to individual property owners for rehabilitation of their buildings. Eligible applicants may receive low interest loans from the Commercial Rehabilitation and Housing Rehabilitation Loan Programs. This program is also available to building owners whose structures are not necessarily historically significant.

9.3 Legal Basis for Cultural Resource Significance Determinations

Appendix G of the California Environmental Quality Act (CEQA) defines the range of cultural resources that must be considered in the evaluation of the effects of a project on the environment:

> **"A project will normally have a significant effect on the environment if it will disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group..."**

Section 5020.1 of the California Public Resources Code states that historic resources "include, but not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California." National Register criteria for the evaluation of historic significance are contained in the National Historic Preservation Act of 1966. This act states that:

> "The quality of significance in American history is present in districts, sites, buildings, structures, and objects of state and local importance that are at least 50 years old, possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
> b) that are associated with the lives of persons significant in our past; or
> c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> d) that have yielded or be likely to yield information important in prehistory or history (36 CFR Section 60.6)."

CEQA Section 21083.2 as amended in 1985, requires that if a proposed project will adversely affect a unique archaeological resource, alternatives must be considered. A unique archaeological resource is defined as:

> "an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is high probability that it meets any of the following criteria:
>
> 1) contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
> 2) has a special and particular quality such as oldest of its type or best available example of its type;

3) is directly associated with a scientifically recognized important prehistoric or historic event or person."

Appendix K of the CEQA Guidelines further stipulates that an "important archaeological resource" is one which:

a) is associated with an event or person of recognized significance in California or American history or of recognized scientific importance in prehistory;

b) can provide information which is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable archaeological research questions;

c) has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind;

d) is at least 100 years old and possesses substantial stratigraphic integrity; or,

e) involves important research questions that historical research has shown can be answered only with archaeological methods.

9.4 Visual Resource Policies, Concerns and Guidelines

Physical Setting: Landscape and Scenic Character

The areas where the most concentrated zone of unreinforced structures are located encompasses lands situated between the low-lying coastal plain adjacent to the Ventura River and the coastal foothills which define the northern portion of the developed downtown area. The Downtown Community vicinity, where the largest number of structures are situated, has considerable topographic relief. Prior to construction of Highway 101, the coastal plain ascended from sea level to an elevation of greater than 300' in less than a 1.5 mile distance; this formerly unbroken expanse was occupied by coastal dune habitats and riparian vegetation. Once the City was settled in the 18th century, gradual changes in the visual environment were initiated through land clearance, construction of buildings, filling low and unstable areas, and devegetation of coastal landforms and hillsides.

Lands included within the Downtown, Avenue, and Catalina Planning Communities (where most of the unreinforced masonry buildings are located) are all characterized by visual diversity with strong contrasts in topographic relief and vegetation. **The inherent scenic quality of the downtown area is enhanced effectively by the wide array and diversity of historic structures and some areas with planted open space.** The qualitatively most unpleasant aspect of the visual environment in the downtown area is the degree to which the U.S. Highway 101 and State Route 33 have effectively interfered with the coastal and riverside view corridors.

The foothills north of these three planning communities define the northern perimeter of the older portions of the City. The foothill environment is the transition between the steeper, more heavily vegetated, interior valley and canyon systems and the developed coastal plain of the Ventura region. To a limited extent, the coastal foothills north of the project area have been graded, contoured, and built out with one, two, and three story residential structures. The City Hall which has been constructed into the coastal foothill overlooking downtown, is located less than 1000 feet from the Main Street Corridor where over one half of the unreinforced buildings in the City are concentrated.

Recent Landscape Modifications: The Urban Environment

Based on a review of early photographs of the City, the landscape and visual characteristics of the Avenue-Downtown-Catalina Communities demonstrated remarkable consistency during the latter part of the 18th and 19th centuries.

During the past fifty years, the rate of change in visual character in the downtown area has increased dramatically. **Major modifications during this time period include:**

- **construction of Highway 101 (in the current alignment)**
- **construction of State Route 33 and overpasses**
- **buildout along the foothills adjacent to and north of the downtown area**
- **completion of Beachfront Redevelopment with Holiday Inn and adjacent parking structure**
- **creation of the museums and parks in Mission vicinity, and**
- **completion of the Mission Plaza retail center.**

Over the past thirty years, a number of large, multi-story structures have been built within or adjacent to the older tract of unreinforced buildings which comprised the downtown business core between about 1880 and 1930. Most of these recently constructed structures (some of which reach a building height of seven stories) are not well integrated into the historic fabric of the downtown community. These buildings, most of which are modernist in conception, have not preserved the continuity of historic setting and architecture which is an established goal of the City. **The dominance and visual discontinuity created by these out-of-context structures has degraded the historic setting and architectural coherence of the downtown area. It is important that this trend is reversed in all future construction programs.**

The downtown area contains a mixture of urban uses and semi-rural characteristics. The northern perimeter of the area where the unreinforced structures are concentrated has residual native vegetation interspersed with specimen street tree plantings. The north side of the Highway 101 right-of-way is heavily planted with tree screening which has matured sufficiently to screen most of the ramps and roadways; this screening also effectively blocks visibility of the downtown area from northbound traffic. Street tree plantings vary in density in the study area. The most effective plantings are situated in the park-museum complex surrounding and west of the Mission and Figueroa Street area adjacent to the downtown historic parks and on the hillsides north of the Mission.

<u>Local Coastal Plan</u>

Because some unreinforced structures are situated within the coastal zone of the City, development practices in this area must be consistent with the City's Local Coastal Program (LCP) and the California Coastal Act (1976). Both the City's LCP and the Coastal Act have specific policies that provide criteria and standards used to assess the potential impact of development on local scenic resources. Applicable policies and standards from these documents were employed in the impact assessment for the amended Plan. The relevant policy is summarized below:

> <u>Coastal Act (Section 30251)</u>
>
> "The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural landforms, to be visually compatible with the character of surrounding areas, and, where feasible, <u>to restore and enhance visual quality</u> in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting."

Other than this general guidance, no other specific visual resource policies have been incorporated into the LCP governing building characteristics.

9.5 Community Aesthetics and Unreinforced Masonry Architectural Values

Each city and region is characterized not only by its natural environment but by the history of its man made environment and architecture. **To the degree feasible, it is important to preserve the relationship between the older portions of the Downtown Community where unreinforced buildings are concentrated and the surrounding older portions of the City.** This historic City core area is very small in relation to the City's present boundaries but this area has much greater time depth and architectural diversity than any other surrounding urbanized areas. This time depth preserves the essential architectural history of the community.

Although the land uses may change through time, the sense of aesthetic integration and continuity in architectural development must be encouraged. The Downtown and Avenue Communities are the oldest portions of Ventura, and as such, these communities contain a record of the aesthetic development and architectural heritage of the City, and, in a broader, regional context, the heritage of California's development.

Such 'old town' areas are being redeveloped in many parts of California without due consideration for the heritage of architectural forms that are unique to California prior to the advent of Modernism and Post Modernism. Since World War II, distinctive regional California architecture has been broadly replaced by buildings designed in accord with Modernist principles which are reflected in large scale suburban developments with simultaneously designed houses that are undistinguished from one another and from one community to another.

Since World War II, much of the housing stock and commercial/industrial development throughout California has been created by individuals living outside of the communities where new construction has occurred. This trend is a significant departure from the way both homes and businesses were conceived and built in the 18th, 19th, and early 20th centuries; during these time periods, usually a home builder or local merchant resided in the community where he/she did business or lived. In recent years, the architectural heritage of the community has been considered less closely in conceiving both residential and commercial developments. Moreover, the building industry has changed and the approach to development has shifted since World War II to producing homes and commercial structures to maximize investment return, a reasonable economic goal. However, as a result, building detailing, custom construction, and regional design considerations have been generalized, minimized, or eliminated. As reflected in recent public comment on the recently adopted Redevelopment Plan Amendment, **there is considerable concern about the gradual replacement of the community's architectural heritage by undistinguished structures which ignore the community's uniqueness and established architectural styles.**

Architectural Setting

There are essentially five different architectural manifestations in the portions of the City where unreinforced structures are located which are related to the historic development of the community of Ventura. These themes provide important organizing principals for considering the diversity of styles available for approaching the solution of aesthetic problems. The essential characteristics of each of these 'periods' in architectural history are summarized in the recently finalized Redevelopment Plan EIR. Illustrations of each type of architectural style are provided in that document.

Unreinforced masonry structures constitute an important component of the City's inventory of historic buildings. **However, most of these buildings with street frontage on major City streets have been modified considerably since their original construction. With several important exceptions, stucco finish work has been used to face most of the unreinforced buildings in the core downtown area along Main Street where the architecturally and historically most significant unreinforced buildings are located.** Most of these

unreinforced buildings are not readily distinguishable from other types of construction due to the gradual replacement of original building details and finish surfaces with more recent surfaces. In many of these buildings, the original brickwork has been completely obscured. With the exception of the distinct window proportions and shapes characteristic of unreinforced buildings, many of the structures in the inventory could not easily be identified as historically significant or architecturally unique.

Architectural Heritage Management in Ventura

The Historic Preservation Commission was established in 1973 under Ordinance No. 1801 and is a seven-member board appointed by the City Council. The duties of the Commission, in addition to designating landmarks, includes review of alterations to designated landmarks. The Commission maintains historic records and a variety of current publications on historic preservation to encourage the interest and support of citizens in maintaining their heritage.

From 1976 to 1987, the Historic Preservation Commission offered the Historic Building Revolving Fund Program which provided low interest loans for landmark owners. The money was allocated from the City's Housing and Community Development Act Funds. In 1977-79, the City had an initial historic building survey done by an intern from the Public History Program at UCSB. At that time, a developmental history of Ventura was prepared and an Historic Preservation Policy and Plan was adopted by the City Council. In 1983, the Cultural Heritage Survey program resulted in an inventory of all potentially historic significant properties in the City's Downtown and Avenue areas. The City of Ventura has also undertaken several major restoration projects, including the Olivas and Ortega Adobes, which are operated by the Parks and Recreation Department, the restoration in 1972 of the Ventura County Courthouse into the current City Hall, the proposed restoration of the Peirano Store, and the recent completion of a restoration of the Dudley House, a turn-of-the-century Victorian.

Architectural Development in the Downtown, Avenue, and Catalina Communities

Prior to 1900, there were two periods of intense building activity in Ventura, one in the 1870's and the other in the 1880's. Both episodes resulted in significant changes to the physical layout and composition of the City. The City began to expand east and south from the Mission. Many new houses were built on Palm, Oak, Meta, Figueroa, Santa Clara and Chestnut Streets during these intervals of growth. Commercial buildings were constructed primarily on Main Street. Most of the buildings built in the 1870's and 1880's in the portion of the City where most of the unreinforced masonry buildings are concentrated are now demolished due to changing land uses and freeway construction. Part of the reason for this growth was the building of the Ventura wharf in 1871 and the arrival of the railroad in Ventura in 1887. Also, farming land was being subdivided in 1867 east of the town (near Telegraph and Telephone Roads), which attracted immigrants. The wharf was a commercial port-of-trade where farmers came to ship crops; warehouses stood near the shore. The lumber and planning mills supporting the building activity in the City were primarily located near the wharf area.
After 1900, the City began to expand eastward from Chestnut Street to Crimea Street, which was the perimeter of the City/County boundary. In the 1880's and 1890's, a few houses had been built in this area while after 1900, the lots began to develop rapidly with Colonial Revival and California Bungalow style residences.

The central business core of older Ventura (from 1860 to 1910) was situated along Main and Santa Clara Streets. Along these two corridors and perpendicular side streets, in contrast with the popular wood frame residences being constructed in the surrounding areas, buildings in the downtown core were constructed dominantly of unreinforced brick masonry. Not yet exposed to the vagaries of earthquake patterns, this technology was popular, replicated the expensive eastern streetscapes of urban America, and provided interesting architectural opportunities for detailing, window construction, ornamentation, and building massing. The popularity of the material was heightened by the local availability of materials (earth, sand lime mortar) which did not necessitate expensive transportation or investment. Brick fabrication kilns developed locally, making an attractive, inexpensive locally available material for commercial construction.

This enthusiasm was adjusted by the Santa Barbara earthquake of the 1920s and the Long Beach quake of the early 1930s. The technology failed the earthquake test of suitability as a building material and was systematically dropped from the inventory of local construction practice by the Depression. Reinforced cement technologies were developed to replace brick as the dominant construction material of downtown Ventura.

North of the downtown area with its high density course of unreinforced brick buildings is the "Avenue" area. The "Avenue" area was subdivided for farmland. Wheat, grains, apricots and honey were important early exports from this area. The land closest to the downtown was again subdivided in the 1880's and a few houses on Park Row and Harrison that remain today were built at this time. Many fine, Vernacular Victorian ranch houses were located on Ventura Avenue. Several have since been moved when industrialization came to the Avenue in the early 1920's with the discovery of oil. The Avenue area changed radically with the opening of many new tracts to accommodate the oil workers and those in related industries. The new schools--The Avenue and E.P. Foster Schools--were built in the 1920's and buildings located on Ventura Avenue began to change from primarily residential to commercial use. Mill School was built in the 1930's. Most of the tracts developed in the 1920's contained modest California Bungalows and Mediterranean style residences. Land that was not developed was filled in with houses in the 1930's and 1940's. Several older houses were relocated to the Avenue from the downtown or from Ventura Avenue itself.

The City has recognized the significance of the downtown area as a heritage resource through its application for and acceptance of the Mission Historic District as a National Historic District listed on the National Register. This area includes some 29.9 acres of archaeological sites, the San Buenaventura Mission, Mission Filtration building, commercial structures built between 1870-1930 and modern buildings. The boundaries are approximately between Poli Street, Ventura Avenue, Santa Clara Street and Palm Street. The area lies at the west end of the downtown commercial district and includes many unreinforced masonry structures. The Mission District is important since it is the area where the founding of the Mission and the beginning of City settlement occurred. The District contains the largest concentration of prehistoric sites and significant buildings in the City. The Mission and archaeological sites have been developed as a tourist center with the construction of the archaeological interpretive center west of the Mission and the construction of the new County Historical Museum across the street. **Several important historic unreinforced masonry buildings (including the Ventura Mission) are located within this district.**

The City also has three locally designated historic districts. **The Simpson Tract** is located within the Avenue Community. This 34.66 acre district is bounded by Ventura Avenue on the east, Sheridan Way on the west, the southern property line of houses on the south side of West Prospect Street, and the northern property line of houses on the north side of West Simpson Street. The district is mainly composed of single family Mediterranean Revival and California Bungalow houses built in the late 1920's and early 1930's. Of the 223 parcels within the district, 182 contain residences of the original tract. The area also contains ten commercial parcels along Ventura Avenue. **Two unreinforced masonry buildings are present within this district (545 and 591 North Ventura Avenue).**

The Mitchell Block Historic District is located within the Downtown Community. This district includes Plaza Park and the properties south of the park on the 600 block of East Thompson Blvd. Eight structures line Thompson Blvd. Built as residences between 1833 and 1905, they reflect a variety of architectural styles from Italianate to Craftsman. **Two unreinforced masonry buildings are present within this district (670 and 692 East Thompson Boulevard).**

The third City historic, **the Shaw Block,** lies on the eastern boundary of the Downtown Community north of Poli Street. It encompasses one city block and is comprised of residential homes, primarily built in the Victorian and Craftsman style. **No buildings in this district were identified on the unreinforced building inventory.**

Cultural Heritage Survey

The primary reason for undertaking an architectural heritage survey was to obtain a comprehensive inventory of historical, architectural and cultural resources in Ventura. This document was designed to provide a basis for decisions by the Historic Preservation Commission and the City Council regarding the declaration of landmarks, landmark districts and points of interest in light of the URM ordinance. The survey was also designed to serve as a planning tool for local government when making decisions as to zoning and rehabilitation of older areas.

The City of Ventura entered into an agreement with the State of California, Department of Parks and Recreation, to do a comprehensive block-by-block survey beginning May 1, 1982. The sections of the community surveyed were the Downtown and Avenue areas, the locations where most unreinforced masonry buildings are located. All buildings in the downtown were photographed and inventory forms were prepared for all pre-1940 buildings. This inventory was used by the consultant to assemble a list of architecturally and/or historically significant unreinforced masonry buildings.

9.6 Inventory of Unreinforced Structures with Landmark Status

For a City the size of Ventura, a relatively large number of unreinforced masonry structures have been designated as landmarks or potential landmarks. Table 9-1 identifies these important cultural resources. Architecturally and culturally significant structures are presented in this inventory including the Ventura Mission, the founding structure in the City. Each of these structures are described briefly in the following summary. Not all of these structures are entirely comprised of unreinforced brick or adobe; some are only partially unreinforced or have a component that is unreinforced.

Landmark #1: Olivas Adobe - 4200 Olivas Park Drive

The Olivas Adobe is situated on a low bluff over the old Santa Clara River on a 6.5 acre site, which is now about 1/4 mile from the river dike. A 30" high brick wall covered with plaster and painted a flat white encircles much of the area around the adobe.

The general architectural style of the Olivas Adobe is Spanish-Moorish patterned after Northern California Monterey Adobes. The plan of the adobe was originally an enclosed courtyard with only two gates through the courtyard wall. Like other California rancho adobes, the Olivas Adobe was constructed with sun-dried adobe brick walls with little wood used in its construction. The Olivas Adobe is somewhat distinct because it is a large two story adobe structures. Such two story adobe buildings were not common in Southern California in the mid-19th century.

The Olivas Adobe is an outstanding example of a two-story adobe in Southern California. Its importance dates back to early rancho period and Mexican landgrant practices common to the geographical influences in this state. Don Raimundo Olivas and Felipe Lorenzana were granted Rancho San Miguel by governor Juan B. Alvarado July 6, 1841 as payment for military service to the Mexican Republic.

A small adobe structure was erected during the year of 1837 even before the land grant was issued, to serve as the homestead of the Olivas family. That structure is still standing today. The smaller adobe became the servants quarters once the large adobe was completed. The smaller 1837 adobe was partitioned into a multi-room caretaker's residence with a chimney for wood burning stove in the early 1930's. In 1943 a modern bathroom was added. The larger adobe was refurbished in the 1920's and 1930's.

Landmark #2: Ortega Adobe - 215 W. Main Street

This simple one story, square-shaped adobe has a red tiled side facing gable roof that extends over the front of the house to form an open porch supported by wooden columns. The double front door is framed with square

wooden beams and is divided into a series of eight panels per door. Buttresses extend from the front and back of the house. During the 1861-62 floods, a 40' frontage of the structure was lost. The adobe was restored by the City of Ventura in 1966.

Construction date: 1857
Builder: Unknown - possibly Emigido Ortega

The Ortega Adobe is the only remaining single story adobe in Ventura. It is the sole survivor of the many adobes that once lined Main Street. It may have been constructed in 1857 by Emigido Ortega using beams from an old adobe in Fillmore.

Emigido Miguel Ortega was the grandson of Captain Jose Francisco Ortega who helped Father Serra in his travels and in the building of the presidio and town of Santa Barbara. Emigido received the property as part of a land grant from Governor Pico in 1846. The adobe remained in the family until 1905 when it was purchased by Ung Hing and became part of the Chinese portion of town until 1913. The City of Ventura has owned the adobe since 1921.

Landmark #10: San Buenaventura Mission and Historic District

The Mission Historic District is comprised of about 30 acres of historic and archaeological sites including the Ventura Mission and related structures that comprised the original non-native historic settlement of Ventura. Unreinforced or partially reinforced buildings included in the District include the Mission and associated quadrangle and buildings, the Water Filtration treatment structure and aqueduct, and the Holy Cross School. The boundaries of the district are defined by Poli Street, Ventura Avenue, Santa Clara and Palm Streets. Commercial structures built between 1870 and 1930 within the District boundary are also included in the designation. The primary buildings comprising the Mission were constructed in the 18th century upon founding of the Mission by the Franciscan Order.

Landmark #15: Bahn's Jewelers - 598 E. Main

The single story brick commercial building has a flat roof with a short red tile parapet. The decorative cornice is a combination of brick relief and glazed terra cotta Spanish tile in a geometric design. The corner location of the building allows for an elaborate front entrance with a stepped parapet at the top and flat roof portico supported by carved brackets over the door. The windows are divided by square brick columns. Above the plate glass windows are a series of three smaller windows with a decorative geometrical pattern in leaded glass. The colorful tile work above the windows formed three arches. At the rear of Bahn's Jewelers is a separate office with entrance on Chestnut Street. On the west side of Bahn's is a separate store with its own Main Street entrance.

Construction date: 1930
Architect: John C. Austin and J.M. Ashley

Bahn's Jewelers was originally constructed as the Ventura Guaranty Building and Loan in 1930. The building was designed by the prestigious architectural firm of John C. Austin and F.M. Ashley who were also responsible for the Griffith Park Observatory & Planetarium (1935) and the Los Angeles City Hall (Austin) (1926-28). Many of their buildings contained murals as did Ventura Guaranty Building & Loan. The interior is extremely elaborate with the west wall covered by three murals painted on canvas by Norman Kennedy of La Jolla and depicting the Mission and early California life. The ceiling is of pre-cast plaster and decorated to give it the appearance of wood combined with stenciling and relief. Portions of the interior have wooded panels and there is an open mezzanine above the offices in the rear of the store and a safe.

TABLE 9-1
Ventura City Historic Landmarks and Districts With Unreinforced Structures or Partially Strengthened Components

Landmark Number*	Historic Resource	Address	Additional Designation
1	Olivas Adobe (CA-VEN-815H)	4200 Olivas Park Drive	SL/NRHP
2	Ortega Adobe (CA-VEN-785H)	215 West Main Street	
10	San Buenaventura Mission	211 East Main Street	NRHP
15	Bahn's Jewelry Store	598 East Main Street	
24	Ventura Theater	26 South Chestnut Street	
25	First Post Office Bldg. (Hess Hardware)	377 East Main Street	
30	Old Town Livery	34 North Palm Street	
32	Peirano Store	204 East Main Street	Part of Mission NRHP District
35	Feraud General Merchandise Store	2 West Main Street	
36	First National Bank of Ventura(1904) (Mills Jewelry)	401 East Main Street	
37	First National Bank of Ventura (1926) (Heirlooms Antiques)	494 East Main Street	

NRHP = National Register of Historic Places
SL = State Landmark
* Landmark Designation on the City List of Numbered Sites

Landmark #24: Ventura Theater and Theater Building - 26 S. Chestnut Street

The Ventura Theater is a long rectangular two-story structure with a combination of red tiled hipped and shed roofs. The main part of the Theater retains its arched window/entrances and recessed triple arched balcony divided by double Corinthian columns. Exposed beams are found under the eaves and once decorative crests provide relief above the arched windows.

The Theater Building on the north side has been modernized with a 1950's look. The marquee was also replaced in 1950. Over the years, the gold leafing has been removed but the interior fixtures remain as well as the silver sunburst dome.

Construction date: 1928
Architect: L.A. Smith - 1928/Kenneth Hess - 1958 alterations

Built in the style of the great movie palaces of the 1920's, the Ventura Theater is Ventura's only luxury theater. The Theater portion of the building, both inside and out, has maintained its integrity over the years. Charles B. Corcoran, who had previously owned and operated the American & Apollo Theaters in Ventura, became the manager of the Ventura Theater. L.A. Smith was the architect and the owner was the American Amusement Co.

The interior of the Theater was extremely lavish with stenciled ceiling beams, chandeliers and a 40' dome with sunburst design of silver and gold leaf. Interior was designed by Robert E. Power Studios of San Francisco.

[Note: Most of this structure is reinforced concrete. At this time, only a small mechanical building incorporated into the theater is the only unreinforced building on this parcel].

Landmark #25: First Ventura Post Office (Hess Hardware)- 375 E. Main

This two-story commercial brick structure features four arched windows on the second floor and an arched doorway. This is all that remains of its original facade. The cornice and other classical details have been removed. The recessed store front entrance and plate glass windows are a later addition. Stucco was applied to the building in the 1970's.

Construction date: June 1903
Builder: H.A. Giddings

This was the first building constructed as a post office in Ventura. In 1902, the Ventura Improvement Co., comprised of local businessmen, was organized with the purpose of raising capital to build a two-story building to house the Post Office. They raised $20,000.00 and the building was completed in June, 1903, by contractor H.A. Giddings.

Landmark #30: Old Town Livery - 34 North Palm Street

This partially reinforced brick structure features a stepped parapet and large radiating brick arched front door and windows. The large square window south of the entrance was a later modification. The structure was added to sometime after 1921. The section in the rear was added, as well as the equipment yard and buildings. Today the property includes the Livery building and the old County Garage Equipment Yard and buildings which have new false fronts attached, done in a western and Victorian theme design.

Construction date: 1906-07
Builder: Herbert Sly

The brick structure was built between 1906-07 as a Carriage house for the Phoenix Stables by William McGuire, Sr. The livery was located where the courtyard buildings are now. It is significant as the only relatively unaltered carriage house in the downtown. In 1921, the County of Ventura purchased the building and turned it into the County Garage. They later added the equipment yard and maintenance buildings.

[Note: This structure was upgraded to Los Angeles County Division 88 standards. Further reinforcement may be warranted to preserve the building from substantial damage if a larger magnitude quake occurs].

Landmark #32: Peirano Store

The Peirano Building is the oldest unreinforced masonry building in Ventura. Built in 1877 by Alex Gandolfo and sold twenty years later to his nephew, Nicola Peirano, the Peirano Store was Ventura's principal general merchandise store for decades. The Peirano Store was situated in the vicinity of China Alley, an historically significant area which once housed several hundred of Ventura's Chinese families. The Peirano Store is directly across the street from the Ventura Mission. In the 1930's, the Peiranos converted the building to a grocery that

was operated for nearly fifty years prior to closure. The City purchased the property in 1987 and is currently seeking a developer interested in restoring the building.

Landmark #35: Feraud General Merchandise Store - 2 W. Main Street

The 1903 building is a 1-1/2 story rectangular building with a flat roof. Built of unreinforced brick, the facade and east side of the building have the most interesting detail. A decorative cornice on the facade of the building contains brackets, inset wood panels, leaf moulding, and "1903" raised numbers.

Two sets of double wooden doors have six panes each with transoms of eight panes above the doors. Four round arched windows separate the doors. The east side of the building has a corbeled brick cornice, round arched wooden windows and wooden door. The west side remains in the natural brick and wooden doors left unpainted. All of the doors and windows are round arched with radiating brick. The rest of the building has been painted white.

Construction date: 1903
Builder: Unknown

This building is significant architecturally for it is one of the few commercial brick buildings from the early 1900's that has not been altered. It was built for Jules Feraud in 1903 as a general store and bakery. Mr. Feraud, a native of Marseilles, France, came to Ventura in the 1870's and had a bakery and general store on the same site in the 1880's. The ovens and wood floors are still intact. The store remained in the family hands until 1944. Plans have been approved to upgrade this building to Level II standards.

Landmark #36: First National Bank of Ventura [1904] (Mill's Jewelry Store) - 401 E. Main Street

This rectangular two-story structure has a flat roof and is sheathed in pressed brick. Alterations to the facade include large plate glass windows and the closing up of the arched windows that faced Oak Street.

Construction date: 1904
Architect: J.H. Bradbeer, remodeled 1948 and 1952, Kenneth Hess
Builder: H.A. Gidding

The building is significant historically as an example of one of Ventura's early banking institutions. Opening ceremonies for the First National Bank of Ventura were held in June 1904. The architect was J.H. Bradbeer and the builder was H.A. Giddings. The building was remodeled in 1948 and 1952 by Ventura Architect Kenneth Hess as the Frank Jones Building.

Landmark #37: First National Bank of Ventura [1926] (Heirlooms Antiques) - 494 E. Main Street and 21 S. California Street

This former bank building has distinctive characteristics for the time period and method of construction. It is 4 stories, reinforced concrete with terra cotta cladding and some brick. It has California/Mediterranean motifs such as the twisted columns, plaques between windows and corbelled cornice line. The Moorish arched windows extend from the top of the 1st floor to the roof. The first floor has elegant rustication around segmental arched openings. Inside, the lobby has stately columns, chandeliers, marble counters and decorative plaster mouldings. Although it had minor alterations in 1939, 1941 and 1963, the building retains its original integrity and is essentially intact.

Construction date: 1926
Architect: H.H. Winner-San Francisco Architect

This structure has architectural significance. It was built by a San Francisco architect, H.H. Winner, as a bank building and was used as a bank until recently. The style is particular to California during this time period - 1926. Its Mediterranean motifs are rare in Ventura. It is located at a prominent corner, just down from the City Hall. Its beautiful terra cotta cladding was popular and expensive even then. Few structures in Ventura have such style and quality in design, craftsmanship and material.

9.7 Inventory of Unreinforced Cultural Heritage Structures with Landmark Potential

The City has a subordinate architectural merit designation in addition to the Landmark designation. These are structures which have potential for inclusion in the City's landmark program. **The six structures that are comprised of unreinforced masonry which carry the Potential Landmarks designation are described briefly in the following summary.**

The Washington Hotel (Old Mission Gift Shop and Offices) - 225-231 E. Main Street

This two-story rectangular shaped building has a flat roof. The second story brick facade remains intact with a band of recessed windows surrounded by raised brick trim. The first floor has been altered with full plate glass windows. A band of brick relief separates the first and second story, and on each end is a brick pilaster with cap. A statue of Father Serra is affixed to the second story of the building with a plaque underneath.

Construction date: 1927
Builder: Unknown

The major portion of this building, the Washington Hotel, was built on the site of the San Buenaventura Mission Quadrangle in the 1920's. In the 1890's, the Quadrangle was removed and a brick building constructed, which became the Oliver Reardon Mortuary in 1912. When the hotel was constructed in the 1920's, it was built onto the existing building. A portion of that building remains on the east side in the rear.

Nash Motor Sales Garage (Trueblood Glass Art and Mercantile) - 230 E. Main Street

This single-story masonry building has a wood truss roof which is barely visible over the stepped brick parapet. The original garage entrance on the east has been enclosed with a wooden door. Large plate glass windows are found on either side of the entrance and the facade is of buff colored bricks.

Le Petite Theater (The Club Soda Building) - 315-321 E. Main Street

The decorative brick facade of this rectangular shaped commercial structure shows the hand of an expert brick layer. The flat roofed building has an interesting frieze under the roofline which is graduated with recessed square design. The frieze extends above the roofline as a parapet in the center of the building. There are four main windows across the upper story and the corners of the building resemble quoins. Above the windows is a recessed alternating and hexagon pattern. The upstairs entrance is flanked by pilasters with caps. The storefronts have been modernized although transom windows exist.

Construction date: 1906-1910
Architect: Unknown

Architecturally, the building is significant as one of the few decorative brick buildings which has maintained its facade except for the storefront modernizations. Built between 1906 and 1910 and owned by William McQuire,

the building was used upstairs as a hall and downstairs, on the west, as Le Petite Theater, moving pictures and vaudeville, Dixon and Dixon, proprietors. For many years the Loyal Order of Moose used the upstairs hall.

Sanchez Brothers Hardware, (Ventura Leather Crafts) - 353-55 E. Main Street

This single story rectangular shaped building features a stepped brick parapet and brick facade with stepped brick coursework across the front. The glazed brick is used decoratively along the edges of the building. The storefronts have been modernized and the transom windows covered over with signs.

Construction date: 1921-22
Architect: Unknown

Built in 1921-22 for Andrew Sanchez, who had the Sanchez Brothers Hardware Store, this building is one of the very few that has maintained its distinctive brick facade. The Sanchez Brothers business was one of the few remaining businesses on Main Street run by the early Spanish families.

Roger's Furniture (Dream Weaver Bedroom Center) - 443 E. Main Street

This rectangular shaped, two-story stucco structure has a flat roof and shed parapet of tile. Under the shed roof parapet are exposed wood beams and a frieze with a diamond pattern design incised. The facade is symmetrical with a high recessed arched entrance and ornate wrought iron decoration. Flanking the entrance are wide glass show windows which curve at upper corners and have red tile below. The rectangular shaped windows above have a shelf underneath and are flanked by capped pilasters.

Construction date: 1890 rebuilt 1926
Builder: Rebuilt portion/Albert Hogsett

The current 1926 facade of this Mediterranean style building was built around an 1890's commercial brick building. The alteration was done in 1925-26 by Albert Hogsett, architect, for Roger's Furniture Company. Since that time, it has always been a furniture store. Prior to its remodeling, Greene and Orton had a furniture store there in 1910 and Charlebois had a hardware store in the other half of the store. The building is a well designed example of the Mediterranean style on Main Street and has kept its integrity over the years.

9.8 Visual and Cultural Resource Impacts of the Proposed Ordinance Options

Issue 1: The No-Project Option--Impacts to the Historic Character of Ventura

Failure to adopt some form of appropriately scaled strengthening program will potentially result in a significant loss of historic structures. The Seismic Risk Model outcomes (described in Chapter 6) have documented that **a moderate to strong quake would result in substantial damage to historic unreinforced structures if movement occurs on the Ventura-Pitas Point Fault or if ground accelerations exceed about .40g on other faults. Less significant but substantial damage is anticipated with a movement on the San Andreas. Assuming damage to historic buildings is equivalent to the average damage predictions in the Model, about 13% of the historic building inventory would potentially require demolition with the predicted movement on the San Andreas and nearly 40% of the City's historic buildings would need to be demolished after a strong earthquake on the Pitas Point. Without some form of strengthening in place, over the next 30 years, about 30% of the historic buildings in the City are likely to be damaged significantly by anticipated future earthquakes.** The empirical evidence obtained after Loma Prieta from the cities of Watsonville and Santa Cruz (described in Chapter 7) indicates that **not only will historic buildings be damaged (perhaps beyond the economically reasonable threshold of repair), but that a substantial loss of architectural fabric and community streetscape identity will also occur in the event of a strong or moderately strong quake.** If a major earthquake event occurs on a proximal fault such as the Pitas Point-Ventura fault, loss of historic structures will be very widespread and systematic. For the more probable but

less damaging event predicted by the model along the San Andreas fault, damage would be less severe but significant effects on the cultural and architectural heritage of the City would occur nonetheless. **The potential loss of historic structures is a significant problem which is best mitigated by implementation of Level III upgrades for any historic structure that the City wants to have in existence in the future.**

The City of Watsonville's stock of historic structures in place before and after the earthquake are significantly different. Nearly all of the large, important heritage unreinforced buildings on the Watsonville central plaza and the one major historic church in the downtown area were damaged to the point that demolition was required. Most of the smaller, less important heritage structures on the periphery of the Watsonville city square have either been demolished or will be subject to stringent renovation requirements which will alter their historic integrity. A similar condition exists in Santa Cruz although the higher density and linear rather than quadrangle plan of the older downtown core has reduced the apparent severity of the earthquake's consequences on the historic integrity of the streetscape in Santa Cruz (except in the Pacific Mall). **Watsonville has been radically transformed from its historic character prior to the Loma Prieta earthquake.**

The failure to adopt some effective form of strengthening for important historic structures will potentially result in the following significant effects:

- **Damage to or destruction of a large percentage of the inventory of historic unreinforced buildings;**

- **Loss of architectural context and historic fabric in the downtown core; and**

- **Demolition of partially damaged historic buildings due to the lack of suitable restoration financing.**

The severity of effects will vary based on the intensity, duration, and location of earthquake events.

<u>Issue 2: Ordinance Effects on the Main Street and Downtown Streetscape: The Potential for Demolition</u>

In response to the Notice of Preparation for the EIR, members of the public and some agency comments expressed reservation about the degree to which the adoption of a strengthening program would potentially alter the architectural quality and historic integrity of individual buildings and the community streetscape. **As discussed in Section 9.5 of this chapter, nearly all of the unreinforced structures in the Main Street corridor have had very substantial exterior modifications in finish surfaces, detailing, and structure. With several exceptions (notably the Old Town Livery, Bahn's Jewelry Store, The Peirano Store and only several other structures), nearly all of the buildings included in the City's inventory have been modified extensively and therefore lack historic authenticity or architectural significance.** The small inventory of historic landmarks are an exception to this situation and the integrity of these structures should be carefully protected. Substantial opportunities for both restoration and reconstruction are presented by the development of an ordinance to upgrade unreinforced structures. With proper guidance and consistent application of reconstruction design standards, the historic and architectural fabric of the older part of downtown could be appreciably improved over present conditions. Therefore, **the strengthening requirements contemplated in all the ordinance options would have potentially beneficial effects on the community streetscape in the older part of Ventura. The effects of ordinance adoption would not be adverse.**

The second major issue of public concern raised in the Notice of Preparation responses regarding the proposed ordinance was related to the potential for demolition if the required upgrades are so extensive that strengthening becomes uneconomical. This is a serious and valid concern; the economic consequences of an ordinance which might encourage demolitions are discussed in Chapter 11. However, the demolition needs to be put into perspective against the background rate of demolition currently occurring in the City <u>without</u> an ordinance. To gain some perspective on the rate of demolition in the City without an ordinance

in place, the number and location of unreinforced buildings demolished during the past 20 years was compiled. Demolished unreinforced masonry buildings in the City are tabulated in **Table 9-2.**

During the past 20 years, a total of 27 unreinforced buildings have been demolished in the City. This rate of removal is relatively high (20% of the current building stock). This pattern reflects a very substantial demolition and removel effort undertaken by the Redevelopment Agency. The funding mechanisms that made such large scale redevelopment efforts possible during the prior two decades are either no longer in place or they are seriously constrained by lack of Federal or State support. In addition, the political conditions in Ventura (and other cities) that made such a rate of demolition possible no longer exist. Therefore, the prior demolition pattern is unlikely to continue. The rate of demolition attributable to adoption of an ordinance in southern California cities is variable and ranges from a low of about 1% of the inventory (in about a 20 year period) to more than 26% (Alesch and Petak 1986:209). The higher range of this span is associated with intensive redevelopment efforts.

With reasonable standards of reinforcement (such as were adopted by Los Angeles), the demonstrated demolition rate is low, in the 1 to 2% range. The background demolition rate in Ventura is substantially higher than the rate in major cities that have adopted an ordinance (which reflects prior redevelopment activity). **The gradual removal through demolition of the unreinforced building stock in Ventura is an ongoing trend; the adoption of an ordinance may accelerate this trend to a limited degree but the rate is unlikely to match the rate of demolition during the past 20 years even with adoption of a relatively stringent ordinance. Based on state-wide comparative data, Adoption of a Level I or II program would produce little if any net change in the anticipated less intensive future demolition rate.**

The City of San Francisco has commissioned one of the most detailed studies of the question: how many buildings would be demolished if an ordinance is adopted? This study (Recht Hausrath and Associates, October 1990) projected anticipated near term demolitions as well as longer term (to the year 2010) predictions which took into account changing land use and economic patterns on the City (Hausrath 1990: 73 to 92). Based on directly comparable strengthening requirements to Ventura proposals and using a base sample that included over 1900 buildings in downtown San Francisco, anticipated demolition percentages were projected to be:

	Demolition Probable		Possible Demolition	
	(1990-2000)	(2000-2010)	(1990-2000)	(2000-2010)
No Project	3%	-	-	-
Level I	3%	3%	3%	2%
Level III	4%	7%	7%	6%

N = 1,959 buildings.

When the subset of commercial buildings only were considered (N = 1,171 buildings), the short term outcomes were virtually unchanged. However, considering the longer term outlook through the year 2010, considering retail/commercial buildings only, **about 12% of the total inventory was predicted to be demolished in response to either a Level I or III option (short term) while between 15% to 17% of the commercial inventory would be demolished under long term projections.** The rate of demolition for buildings used either for rental housing or for tourist purposes was predicted to be very low (2% in response to Level I and 3% for Level III upgrades). It is important to note that the demolitions referenced in these percentages include <u>both</u> demolitions resulting from redevelopment efforts <u>and</u> building owner responses to economic decisions.

Inclusion of a "like for like" replacement option in any ordinance proposal would contribute to making an ordinance more acceptable to the property holders who own the unreinforced building stock. The "like for like" replacement option potentially increases the value of an unreinforced building and provides an owner with the opportunity to decide what course of action is proper given the many variables that need to be contemplated in deciding how to dispose of a building located in a City which requires a relatively stringent strengthening program. **However, inclusion of this option in an ordinance is likely to increase the rate of demolition since this option would become economically a more favorable decision than retaining an existing building.**

Because even upgraded buildings have the potential to fail to a certain degree (perhaps even radically if an earthquake is sufficiently strong), the advisability of spending $20.00 to $30.00 per square foot for upgrades may be questionable. **The "like for like" replacement option at least provides the property owner with an opportunity to judge and decide how to dispose of, reconstruct, or replace an unreinforced building.** The more stringent the upgrade requirement, the more likely that selective demolitions would occur. For this reason, the consultant determined that a comprehensive and extensive upgrade ordinance (**Level III or greater**) would potentially contribute to the current trends which are reducing the unreinforced building stock in the City. **However, would a reduced unreinforced building stock really affect the historic integrity of the streetscape? Given the current condition of many unreinforced buildings and the extensive modifications that have occurred to facades since original construction, these potential demolition effects would be considered adverse but not significant. As long as some representative examples of important historic unreinforced structures are preserved in the City, the potential for demolition resulting from ordinance adoption to effect the cultural setting and streetscape in the City is negligible.** It is also important to stress that in cities that have adopted strengthening programs, the pace of demolition has not varied significantly from demolition rates prior to the adoption of strengthening requirements (Alesch and Petak 1986). **Therefore, considering all of these concerns and sources of evidence, the consultant determined that adverse effects of ordinance adoption on the streetscape would not be significant.**

Issue 3: Historically or Architecturally Significant Buildings: Special Considerations and the Preservation of Building Integrity

The purpose of the following discussion is to clarify that the adoption of an ordinance would not adversely effect the condition, character, or historic significance of any important local, City, State, or National Landmarks. The degree to which any ordinance option effects building integrity is a product of the types of strengthening programs undertaken. **Given the options presented below, adoption of an ordinance would not necessarily adversely affect the historical or architectural character of important unreinforced structures. Careful case by case evaluation of strengthening requirements will be required to minimize adverse effects on historic structures.**

The presence of exterior ornamentation (such as occurs on the Bahn's Jewelry Building) or other significant architectural or historic exterior features, will influence the design options available to provide protection from earthquake damage while still preserving historic building integrity. Often, the least expensive engineering retrofit technique will be unacceptable for historic buildings because of the visual incompatibility of simple solutions with the building fabric. In addition, because removal and reinstallation of existing finishes is required to permit installation of many strengthening activities, extra care and cost may be required to adequately preserve and protect the historic structures.

Table 9-2
Demolished Unreinforced Masonry Buildings in the City of Ventura: 1970-1990

Date Demolished	Location	Explanation
1969	507 E. Thompson	New construction by Standard Oil
1969	664 E. Main	Private parking lot development
1969	676 E. Main	"
1970(*)	366-368 E. Main Street	Mini Park
1974	46 N. Ventura Avenue	Redevelopment
1974	20 N. Ventura Avenue	"
1974	79 E. Main	"
1974	95 E. Main	"
1974	123 E. Main	"
1974	139 E. Main	"
1974	52 E. Main	"
1974	122 E. Main	"
1974	154 E. Main	"
1974	172 E. Main	"
1974	186 E. Main	"
1974	196 E. Main	"
1974	163 E. Santa Clara	"
1975	15 E. Main	"
1975	43 E. Main	"
1982(*)	15 N. Garden	Mission Plaza Redevelopment Project
1982	30 N. Garden	"
1982(*)	77 W. Main Street	"
1982	39 W. Main Street	"
1983	35 N. Ventura Avenue	"
1983	45 N. Ventura Avenue	"
1983	197 W. Main	"
1989	532 E. Main	Demolition subsequent to fire damage

* Date uncertain

The amount of significant historic or architectural exposure displayed by a structure is dependent on many factors, including the architectural style, the amount of interior and exterior public space, and the amount of effort expended in detailing in the original construction program. Most historic architectural styles concentrate details and ornamentation in public spaces or on public facades. The interior of most buildings include both public and private spaces, with proportions of each type of space varying with occupancy. Of the typical building use categories addressed in this study, industrial buildings generally have the least amount of public space; residential, office, and commercial buildings have a moderate amount; and assembly buildings usually have the most dedicated public space. On the exterior, most buildings usually have at least one public facade, where architecturally or historically significant building significance is concentrated. Corner buildings have at least two public facades. For many historic styles, the amount of architectural elaboration and detailing was directly related to the budget available at the time of construction. **From the nineteenth century through the 1930s, buildings were ornamented much more extensively than present architectural trends. In general, the greater the original architectural expenditure in construction, the higher the historic cost premium for strengthening is likely to be.**

Visibility of Various Strengthening Activities on Architecturally or Historically Significant Buildings

The two important potential visual impacts of seismic retrofit strengthening techniques on architecturally or historically significant buildings are (1) the effect on existing finishes and (2) the level of visibility of a new structural element in the building. There are four possible visual consequences of seismic retrofit activity on historic structures. These outcomes include:

1. No visibility is expected for this activity.

2. The visibility level is low; however, careful finish repair will be needed.

3. The visibility level is moderate, so, in addition to careful finish repair, more sophisticated design techniques will also be required.

4. The visibility level is high, and an alternative strengthening activity will be necessary.

Table 9-3 assigns one of these four visibility rankings to building exteriors and interiors for all known strengthening activities and concludes whether finish repair will be warranted.

Discussion

Many of these activities will require careful interior finish work to preserve and match the existing building fabric. Some finishes cannot be replaced or replicated. Imperfect finish matches in small areas may be tolerable; such affected areas might include tension and shear anchor access holes, non-parapet falling hazard anchorage locations, or the vicinity of collector, chord and other steel beam and column connection locations. Where large amounts of finish work are required, such as the cover for concrete placed against a wall or for special floor materials following diaphragm strengthening, aesthetic sacrifices may be necessary to fully comply with the requirements of effective seismic upgrades. **In addition, some tradeoffs may be necessary enabling more disruption to the interior of historic structures to preserve the historic quality of the streetscape.**

Four strengthening procedures that may result in exterior visual intrusions and would require special design considerations are tension anchors, anchorage of non-parapet falling hazards, infilling openings, and steel diagonal braces. Tension anchors that extend entirely through the URM wall with a visible bolt and plate on the exterior face are the least expensive. Through-bolted anchors can, however, be replaced with drilled angled epoxy anchors that are not visible on the exterior face. Similarly, for some ornamentation that presents a falling hazard, epoxy anchors can be used instead of throughbolts, or the ornamentation could be

replaced with lighter simulated materials that are easier to attach to the structure. When openings are infilled to increase the strength of the wall, the easiest option is to replace the window with concrete or concrete block that would be visible from both the interior and exterior. In some situations, it may be possible to infill behind the window only a portion of the total wall depth and leave the window in place; since many historical buildings have recessed windows, another approach is to remove the window, infill the opening, and then cover the infill with a screen or other covering that suggests the presence of a window.

For all three of these activities, the interior would be finished to match the wall near the anchorage location or window opening. Diagonal braces are often placed on the inside face of exterior walls; consequently, those braces that cross the window opening may be visible from the exterior of the building. The braces can be painted with colors that are less noticeable or finished with gypboard; however, they would still be visible through window openings. Occasionally, it is even possible to use bracing geometry that, while structurally adequate (but not necessarily optimum), affects a minimum of openings. Nonetheless, if the level of visibility is considered too high, then diaphragm strengthening, placement of concrete against interior walls, or steel moment frames could be used in place of the braces.

Several strengthening activities would result in interior visual intrusions and would require an alternative activity. Exposed steel interfloor wall supports, for example, are generally replaced with hidden interfloor wall supports. Moreover, in most cases, adding plywood crosswalls, concrete/masonry shear walls, or plywood shear walls in the middle of interior spaces would be highly intrusive, particularly in churches, theaters, or public assembly buildings. Interior diagonal braces, although not commonly required, may have similar drawbacks. Instead, diaphragm strengthening, placement of concrete against interior walls, or steel moment frames may be used.

In summary, based on the preceding review, it is clear that strengthening activities can be arranged to minimize or virtually eliminate significant adverse impacts on historic building integrity. However, the use of visually hidden strengthening programs would potentially make a strengthening program more expensive, time consuming, and disturbing to building occupants. However, adequate mitigation of effects on historic building character can be arranged on a case by case basis for buildings determined to be of either architectural or historic value.

9.9 Do Existing Historic Building Codes Provide Effective Mitigation Against Earthquake Potential in Ventura?

Mitigation of earthquake impacts to culturally and architecturally significant buildings is a very complex (and potentially expensive) matter. The following discussion of codes affecting historic buildings and the prior assessment of the visibility of strengthening activities all need to be taken into account in designing a mitigation program for historically significant structures. These considerations were originally addressed in the Rutherford & Chekene report on this topic to the City of San Francisco (Rutherford & Chekene: 1990). The following discussion is abbreviated and summarized from that document.

TABLE 9-3
The Visibility of Strengthening Activities on Historic Buildings

	Possible Strengthening Activity	Exterior Visibility	Interior Visibility	Requires Finish Repair
o	Tension Anchors	3	2	Yes
o	Shear Anchors	1	2	Yes
o	Interfloor Wall Supports (Exposed)	1	4	N.A.
o	Interfloor Wall Supports (Hidden)	1	2	No
o	Supplemental Vertical Supports	1	2	Yes
o	Anchor Non-parapet Falling Hazards	3	2	Yes
o	Roof Sheathing with New Roof (Outside)	1	1	No
o	Roof Sheathing Inside (Ceiling)	1	2	Yes
o	Roof Crossbracing or Special Solution	1	2	Yes
o	Floor Sheathing - Open Area	1	2	Yes
o	Floor Sheathing - Existing Partitions	1	2	Yes
o	Chords	1	2	Yes
o	Collectors	1	2	Yes
o	Strengthen Existing Crosswalls	1	2	Yes
o	Add Plywood Crosswalls	1	4	N.A.
o	Steel Moment Frame (as Crosswalls)	1	2	Yes
o	Infill Openings	3	3	Yes
o	Concrete Against Wall	1	2	Yes
o	Steel Diagonal Brace	3	2	Yes
o	Steel Moment Frame (as Lateral Element)	1	2	Yes
o	Interior Concrete/Masonry Shear Wall	1	4	N.A.
o	Interior Plywood Shear Wall	1	4	N.A.

Ordinal Scale:

1. No visibility is expected for this activity.
2. The visibility level is low; however, careful finish repair will be needed.
3. The visibility level is moderate, so, in addition to careful finish repair, more sophisticated design techniques will also be required.
4. The visibility level is high, and an alternative strengthening activity will be necessary.

The governing code for qualified historical buildings in California is the State Historical Building Code (SHBC), which is found in Part 8 of Title 24 of the California Administrative Code. The SHBC was originally published in 1979 and was amended on April 20, 1988. Prior to amendment, the code was an alternative that local jurisdictions could use in addressing the rehabilitation (including seismic retrofits), preservation, restoration, or relocation of historic structures; following amendment, the code is now a requirement. As of March 1990, although the State law for the amendment has passed, no implementing regulation has been approved by the Building Standards Commission (Turner, 1990).

The intent of the code is "to encourage the preservation of qualified historical buildings while providing a reasonable level of structural safety for occupants and the public at large" (SHBC, 1979). **Implicit is the recognition that requiring retrofits of buildings to meet the current building code may be too restrictive and expensive and may be detrimental to the aesthetic character of the structure. Consequently, the SHBC requirements were intended to be less stringent than current building codes.**

Under the SHBC, an historic structure is evaluated by an engineer, and if it "does not comply with the minimum conditions of [the code, it is] considered substandard and must be corrected" (SHBC, 1979). Unfortunately, the actual SHBC provisions provide few rigorous engineering criteria for determination of "minimum conditions" in unreinforced buildings. "Conformance to basic engineering practice is required to the extent applicable"; a continuous lateral force path must be provided; a single outdated height-to-thickness (h/t) requirement of 12 must be met for all walls; a design shear strength value of 6 pounds per square inch (psi) can be used in walls; and there are a few wood diaphragm shear strength values. The actual force levels used for determining demands on the structure are not specified (SHBC, 1979).

The SHBC does, however, state that its provisions "are not intended to prevent the use of any proposed alternative design, material or method of construction not specifically prescribed or allowed by SHBC, provided any such alternative will facilitate the preservation of historical buildings or structures and has been approved" (SHBC, 1979).

It is the State Historical Code Board that approves alternative design procedures related to interpretations of the SHBC in specific building cases. According to Clarence Cullimore, the Executive Director of the SHBC Board, several alternatives have been approved, including Los Angeles Division 88, the current Uniform Code for Building Conservation (UCBC) which is very similar to Division 88, the ABK methodology, and the methodology embodied in the ABK report Guidelines for the Evaluation of Historic Unreinforced Brick Masonry Buildings in Earthquake Hazard Zones. The proposed UCBC amendments may be approved by the SHBC Board in future situations (Cullimore, 1990).

In summary, the existing Historic Building Code is primarily designed to minimize the effects of structural improvements while preserving, to the extent feasible, the historic character and quality of a structure. The Historic Building Code traditionally allows for greater flexibility in building design and a reduction in compliance with engineering standards to achieve authenticity. In the event of a moderately strong earthquake, historic buildings, if strengthening programs are compromised extensively to assure authenticity, will potentially be severely damaged.

9.10 Mitigation Recommendations

Cultural and Visual Resource Mitigation Planning

Given all of the considerations outlined in this section, it is evident that the management of the transition through a strengthening program will require further detailed planning on a case by case basis for historic structures. Recognizing the potentially unique architectural reconstruction/restoration possibilities in the downtown area, the consultants recommend the following mitigation measures:

(1) The City Historic Preservation Commission, based on the advice of the Building Official, shall prioritize designated City Landmarks and Structures of Merit as the building stock of historic structures to be preserved in the event of a moderate to strong earthquake. Engineering studies shall be performed on these structures (by the building owners with the assistance and cooperation of the City) to determine what modifications are necessary to enable the structures to withstand either the maximum credible earthquake for Ventura or an appropriate design quake selected by the City. The final protective design for these structures shall consider both the interior and exterior visual effects of various strengthening activities on the historic integrity of the buildings. The basic design objective shall be biased towards preserving the historic integrity of the streetscape facades of these buildings rather than historic building interiors.

(2) All strengthening work on buildings of historic significance shall be performed in accord with a set of standards developed by the City to restore the exterior visual quality and detailing of these buildings. These standards should address:

- o building detailing,
- o brick repointing,
- o restoration of stone elements,
- o painting guidelines (brick painting should be prohibited),
- o use of historic wall anchor styles,
- o signage and awnings,
- o removal of stucco (unless such a surface was present on the original building)
- o other features determined significant by the Historic Preservation Commission.

(3) With the cooperation of property owners, the City shall establish an Historic District encompassing the boundary of all unreinforced masonry structures included in the Main Street Corridor. This district should be created to assist in designing and funding a comprehensive, unified solution to strengthening within this corridor. The District should be organized to utilize Marks Historic Bond Act funds, Mills Acts Contracts, and other resources to assist in upgrade efforts. Individual property owners should be required to pay a fair share of any future reconstruction activities within this corridor if a formal Assessment District is established to complement the Historic District Designation. At a minimum,

properties within the proposed District should be afforded the opportunity to participate in Mills Contract programs to help defray the costs of upgrading.

Discussion

Mitigation Measure 1

Regarding Mitigation Measure 1, the consultant recommends that, at a minimum, the following structures (identified in **Table 9-4**) should be considered for special treatment as important or unique historic structures.

In comments on the Draft EIR, the City's Historic Preservation Commission recommended that about ten additional buildings be included in the inventory of structures to be considered for **Level III** reinforcement. The complete list of structures this Commission believes should be considered for some form of special preservation strengthening is presented in **Table 9-5.**

Inclusion of these buildings in a **Level III** program would assure that a substantial and representative sample of unreinforced structures are preserved even if a moderately strong earthquake occurs on the Pitas Point-Ventura fault.

Table 9-4
Historic Unreinforced Buildings Recommended for Special Consideration

Building Address		Square Feet	Building Name
204	Main Street E	2,202	**Peirano Store**
208	Main Street E	1,953	**Wilson Studio**
211	Main Street E	7,322	**San Buenaventura Mission**
375	Main Street E	4,036	**First Post Office Building**
401	Main Street E	3,000	**First National Bank of Ventura**
451	Main Street E	8,889	**El Jardin Patio**
494	Main Street E	23,280	**First National Bank of Ventura**
592	Main Street E	4,157	**Bahn Jewelry Store**
2	Main Street W	7,000	**Feraud General Merchandise Store**
215	Main Street W	750	**Ortega Adobe**
4,200	Olivas Park Drive	2,921	**Olivas Adobe**
	Total Square Feet	**67,530**	

TABLE 9-5

**HISTORIC PRESERVATION COMMISSION
UNREINFORCED MASONRY HISTORIC BUILDINGS
RECOMMENDED FOR CONSIDERATION FOR SPECIAL
CONSIDERATION**

Address	Historic Name (Current Name)	Landmark No.
204 E. Main	Peirano's Market	32
208 E. Main	Wilson's Studio	32
211 E. Main	San Buenaventura Mission	10
375 E. Main	1st Ventura Post Office (Hess)	25
401 E. Main	1st National Bank (Mill's Jewelry)	36
451 E. Main	El Jardin Patio	63
494 E. Main	1st National Bank (Heirloom Antiques)	3
592 E. Main	Ventura Guaranty Building (Bahn's)	15
2 W. Main	Feraud General Merchandise (1903)	35
215 W. Main	Ortega Adobe	2
4200 Olivas Park	Olivas Adobe	1
670 E. Thompson	Mitchell Block Historic District	
692 E. Thompson	Mitchell Block Historic District	

SOURCE: Historic Preservation Commission, City of Ventura
May, 1991

Note: Unlisted buildings the Commission felt merited some consideration included the following structures:

107 S. California	Masonic Temple
305 S. Kalorama	Star Rug
221 E. Main	Washington Hotel (Mission Gift Shop)
230 E. Main	Nash Motor Sales (Trueblood's)
443 E. Main	Roger's Furniture (Dreamweaver's)
315 E. Main	La Petite Theater (Club Soda)
353 E. Main	Sanchez Brothers Hardware (Ventura Leather)
540 E. St. Clara	Hotel Fosnaugh (Midwick/Hensley)

Summarizing, the total square footage of historic buildings recommended for Level III upgrades is 67,530. At about $14.00 per square foot, the estimated cost to perform upgrades on these buildings would be $945,420. Although this represents a very significant investment, this degree of commitment is required to assure that a small sample of representative buildings are preserved.

Several historic structures in the City have been partially strengthened (including the Ventura Mission); the consultants recommend that the City consider the adequacy of the prior standards used to strengthen some important buildings in the City's inventory of historic buildings. For example, the Old Town Livery has been partially strengthened. Previously upgraded historic buildings should be reviewed for compliance with effective building damage reduction practice.

Mitigation Measure 2

Mitigation Measure (2) is oriented to assuring that minor restoration work done during strengthening is performed in a manner that will restore or preserve the historic integrity of the unreinforced building stock. These proposed standards should, in the consultant's judgement, be adopted as formal standards (not just guidelines). On all buildings designated for landmark status and special assistance in financing upgrades, high standards of restoration should be achieved.

The post 1945 exterior treatments of some unreinforced structures designed by architects working in the City has, in some cases, not taken advantage of the unique surfaces and textures of brick. For example, beneath the textured stucco and dark paint on some existing facades along Main Street are some of the finest examples of stone detailed unreinforced masonry in the City. The development of a set of standards for exterior detailing on reinforced buildings of architectural and historic merit will reveal and restore an underlying stock of excellent, well detailed, buildings. The consideration of restoration of exterior surfaces should be done on a case by case basis. For example, the stucco finish on the Ventura Inn is very excellently worked using the classic near-smooth trowel finish that is an important attribute of effective Mission Revival buildings. Where well preserved or appropriate finishes are present on brick, finish removal may not be warranted.

Mitigation Measure 3

Discussion: Rejection of a Coordinated Strengthening Program for the Main Street Corridor

In the Draft EIR, the consultants recommended that a coordinated building strengthening program be considered for the Main Street corridor. In order to determine whether such a program could be implemented effectively, during the review of the Draft EIR, the consultants reviewed options for implementing such a program.

There are two primary advantages to coordinating strengthening activities or to strengthening buildings in groups:

1. The potential damaging interaction between adjacent buildings can be considered in the strengthening scheme and efficient mitigation can be included.

2. The average cost of retrofit can be reduced by increasing the size of the construction project and by maximizing the efficiency of certain lateral force resisting elements (primary new shear walls or frames).

In general, the more alike adjacent buildings are in height and depth, the more efficient coordinated strengthening would be. Adjacent buildings that are significantly different in height, depth, or overall bulk will present more difficult problems of seismic interaction, whether or not the strengthening is coordinated. In general, retroactive seismic strengthening ordinances in other cities have not dealt with the issue of coordinated strengthening; each building is usually treated as a free-standing and independent structure. Because many of the buildings in Ventura have shared (or party) walls, assessment of coordinated strengthening appeared to be a feasible mitigation option.

The improvement in overall seismic performance of buildings strengthened as groups, rather than individually, is difficult to quantify. In cases where nearly identical buildings are present, coordinated and independent strengthening would produce approximately equal amounts of seismic resistance. In cases where adjacent buildings are non-identical or highly incompatible building (e.g., differences in height, shape, and size), significant damage may be avoided by coordinating strengthening.

Since coordinated strengthening has not been adopted in any significant retrofit program implemented to date, the costs of such programs are difficult to estimate. However, in cases where coordinated strengthening is required of incompatible buildings, it is anticipated that costs premium would be in the 10% range. Therefore, coordinated strengthening is probably only economically sensible in cases where adjacent buildings are similar in size, height, and shape. The cost savings discussed below are based on comparisons of coordinated upgrades of compatible buildings with individual upgrading without coordination between buildings.

Based upon breakdowns of retrofit costs published elsewhere (Seismic Retrofitting Alternatives for San Francisco Unreinforced Masonry Buildings, 1990; Typical Cost for Seismic Rehabilitation of Existing Buildings, FEMA 157, 1988), the cost of in-plane shear elements (walls, frames) is, on average, about 15% of the total. By coordinating designs, these elements could be minimized; based upon an estimate that at a maximum, 2/3 of these elements could be eliminated, the savings in cost would amount to 10% (2/3 of 15%).

Although the cost of retrofit is known to vary considerably, average costs (without occupancy) can be used to estimate ranges of dollar savings that might be therefore expected from coordinated strengthening schemes:

EIR Strengthening Level	Level I	Level II	Level III
Average Cost[1]	$4.80/sf	$6.50/sf	$10.54/sf
Average Savings	None[2]	$0.66/sf	$ 1.05/sf
Problem Range of Savings[3]	$0.50-$2.00/sf	$0.50-$3.00/sf	

1 From EIR

2 In-plane shear elements are not required for Level I

3 Range considers normal range of retrofit costs plus the possibility that savings in areas other than in-plane elements may be realized.

Legal considerations and future land use decisions could substantially conflict with any decision to coordinate upgrades between buildings. Although the consultants have little knowledge of how legal agreements would need to be structured between adjacent owners, several problematic situations would have to be covered by any such agreement. If a group of buildings is to be considered a single structural entity for strengthening purposes, then the removal of any one of the buildings could jeopardize the seismic capacity of the remaining structures. Thus, demolition and replacement would be severely limited for every individual owner if coordinated strengthening is pursued. Accidental removal (by fire or earthquake) of an individual building could also affect the structural integrity of remaining buildings and therefore, group insurance would probably be required. Even remodeling, if the overall lateral system were to be affected, would have to be controlled. Sales of individual buildings could also be affected by such interdependence. A previous attempt by the City to organize coordinated strengthening on the 200 block of Main Street for redevelopment project failed to materialize, possibly for some of these reasons. If a group of individual buildings has one owner, then many of these problems would be minimized and the cost and performance benefits of coordinated strengthening may be more easily obtainable.

Review of the building inventory on Main Street indicates that all Main Street blocks contain either empty lots, previously strengthening buildings, structures built of other types of materials other than brick, or the blocks have configurations that would make coordination difficult. The most promising groups for coordinated strengthening therefore consist of subsets of three to five buildings each. Some of the advantages initially anticipated by the consultants for coordinated strengthening are therefore not realistic.

In summary, the following conclusions were derived from the assessment of the viability of coordinated strengthening:

1) Despite appearances, actual building groups in downtown Ventura appropriate for coordinated strengthening are limited to a maximum of 3-5 buildings.

2) The probable cost savings of group strengthening are relatively small, of the order of 10% of the total cost of the project. On a typical **Level III** program, this savings would amount to about $1.40 per square foot.

3) Regulations that will partially coordinate adjacent buildings and therefore improve performance while maintaining individual building control may be possible but are not advised due to the potential legal problems associated with implementing agreements between property owners and because coordinated strengthening would adversely limit future land use decisions.

4) Agreement between owners to enable true coordinated strengthening would place restrictive limitations on each individual owner.

Based on these conclusions, the consultants recommend that:

- Coordinated strengthening should be allowed, but not emphasized. Official recordation should be required in such cases so that limitations on the property will be understood in case of transfer of ownership.

- Strengthening provisions should be investigated that would mitigate adjacency problems to the extent possible while preserving building individuality. Such provisions could be added to either **Level II** or **Level III** strengthening requirements; it would be inappropriate to add such provisions to a **Level I** program.

The Mills Act

Mitigation Measure (3) was recommended to encourage creation of a framework for implementing a coordinated upgrade program in the Main Street corridor and to assist in meeting the necessary basis of compliance with Mills Act provisions, one of the more favorable approaches to assisting some property owners in defraying the costs of an upgrade. The recommended boundary of the proposed District designation is provided in **Figure 9-1.**

This Mitigation Measure addresses the special problems and opportunities in the Main Street corridor. For a variety of reasons explained in the concluding chapters of the EIR, the consultant has recommended that the strengthening program in this area be somewhat more ambitious than in other parts of the City. It may be necessary for the City to assist property owners in this area to some degree to achieve compliance with any proposed ordinance to prevent tenant dislocation and decline of economic vigor. **The City should, at a minimum, afford property owners in this area an opportunity to participate in Mills Contracts to partially defray upgrade costs. Participation in this program would probably require adoption of an Historic District designation to assist owners in qualifying for the program. The use of Mills Contracts and the effects of such contracts on the owners, the City, and the County are outlined in the following discussion.**

The California Preservation Foundation Introduction to the Mills Act

Based in San Francisco, the California Preservation Foundation, a non-profit organization, has actively pursued educating the government agencies, building owners, and the public, about the advantages and applications of Mills Act Contracts. In September of 1990, the Foundation conducted an important workshop on the Mills Act and prepared and distributed a workbook on the topic to seminar participants (What Is In It For You: Capitalizing on Historic Resources with the Mills Act and Other California Preservation Incentives, California Preservation Foundation, September, 1990). The following discussion has been extracted (with minor modifications) from the Foundation's workbook. The sample calculations used in the following discussion were based on an example prepared by the Foundation included in the referenced Workbook. Information extracted from the Foundation's workbook is indented below.

> As a preservation incentive, historic property agreements offer advantages to both the local government and the property owner. These agreements, commonly referred to as "Mills Act contracts", provide for property tax relief for owners of qualified historic properties who agree to comply with certain preservation restrictions. The use of Mills Act contracts gives communities the flexibility to deal with historic structures on a case by case basis. The local government has the option to choose which properties are suitable for the incentive by evaluating various factors, such as the significance of the building to the community, development pressure on the site, or the need for rehabilitation. These contracts can be used both as a tool to preserve an individual building and as part of a broader community-wide program.
>
> For owners of historic properties, Mills Act contracts offer several distinct advantages. Unlike some other preservation tools, participation on the part of the property owner is completely voluntary. In addition, a historic property contract is one of the few incentives available to homeowners, and in California's expensive residential real estate market the lower assessed valuation can represent a real savings. In areas where land value represents a large portion of the market value, such as high density commercial and residential districts, the Mills Act method of valuation adjusts the property tax to reflect the actual use on the site, and can offer significant reduction in taxes for owners of historic buildings.
>
> Another important benefit of this incentive is that, since historic properties continue to be protected by the contract when the property is sold, the reduced property tax valuation is passed on to the new owner. Since sale of the property does not trigger a Proposition 13 reassessment on sale, the existence of a Mills Act contract can be an important sales incentive.

Background

In 1976, legislation was adopted in California which created an alternative method for determining assessed value for certain qualified historic properties. Now known as the **Mills Act**, the law provided for an income-based tax formula for qualified properties subject to historic property contracts. This legislation was modeled after the Williamson Act, which had been widely used to preserve open space and agricultural land. **Table 9-5** outlines some of the salient features of this program.

Originally, under the Mills Act, the property owner was required to enter into a 20 year contract with the local government which provided, in part, that the exterior of the property be visible to the public, that significant interiors be open to the public on a limited tour basis, and that the interior and exterior be made available to students of architecture, history, and related disciplines, and government representatives conducting survey and recording programs, or checking on contract compliance.

TABLE 9-5

Mills Act Contracts:

- o Are voluntary and flexible;
- o Offer benefits to owners of properties on local, State, or National registers;
- o Can be used with private homes as well as income producing properties;
- o Remain in effect upon a change of ownership;
- o May encourage home buyers to purchase designated structures; and
- o Can provide for permanent maintenance of historic resources.

In light of these provisions, is it perhaps not surprising that very few Mills Act contracts were entered into between 1977 and 1984. In 1985, amendments were passed that deleted most of the access requirements, reduced the minimum term of the contract to 10 years and broadened the definition of qualified historic properties. Only recently have a number of cities taken the lead in promoting the use of Mills Act contracts, among them Rancho Cucamonga, Redwood City, Palo Alto, and Los Altos.

Eligible Property (Government Code Section 50280.1)

In order for a property to be subject to a Mills Act contract, it must either be listed on the National Register of Historic Places, be located in a National Register or local historic district, or be listed on a State, County, or City and County official register. THe City need not establish an historic district to implement the Act; maintaining a list of relevant historic buildings is sufficient. To determine whether a property is eligible for a Mills Act contract on the basis of local listing, property owners should contact the City for information on local registers and the criteria and procedures necessary to qualify for listing. Information on the National Register and State

Landmarks is available from the National Park Service regional office in San Francisco and the State Office of Historic Preservation in Sacramento (see Resource List, Appendix 17).

The owner of an eligible property may apply to the local government to enter into an historic property contract. If the local government agrees to a contract, it has the discretion to set such terms as are "reasonable to carry out the purpose of preservation of the property." However, the statute does provide for a number of mandatory contract provisions which are set out in Government Code Sections 50281 and 50282.

Historic Property Contract Provisions (Government Code Sections 50281, 50282)

The minimum term of a Mills Act contract is ten years, and each year the contract is automatically renewed for an additional year on a specified date unless a notice of non-renewal is given. Either the property owner or the local government may elect not to renew for any reason. The effect of non-renewal is to terminate the contract at the end of the current ten year term. The specific procedures for non-renewal are found in Government Code Section 50282.

As appropriate, the contract may provide for the preservation, restoration and rehabilitation of the property according to the standards of the State Office of Historic Preservation. Several of the cities that have prepared Mills Act contracts require the use of Secretary of Interior's Standard for Rehabilitation. The City of Ventura could adopt recommended design standards (Mitigation Measure 2) in conjunction with strengthening requirement definitions which would need to be complied with by any contracting owner. The contract may also provide for periodic examination of the property to assure compliance with the contract terms.

Under a Mills Act contract, the property owner is obligated to prevent deterioration of the property, in addition to complying with any specific restoration or rehabilitation provisions contained in the contract. Restrictions might include prohibition of demolition or alteration only with City approval.

In the case of breach of the contract conditions by the property owner, including the duty to prevent deterioration, the local government has the option of either bringing legal action against the owner for compliance, or cancelling the contract. In the event that the contract is cancelled, the owner is assessed a penalty of 12 1/2 percent of the market value of the property at the time of cancellation.

The statute also provides for recordation of the contract within 20 days of its execution. Although contracts may be entered into at any time, the new valuation will not take effect until the assessment date of March 1st in any given year. Mills Act contracts are binding on all successors in interest to the original owner, subject to the provisions stated above.

Valuation (Revenue and Tax Code Section 439.21)

Once a property is subject to an historic property contract, the property is valued according to the "income" method set out in Revenue and Tax Code Section 439.21. Generally, the income, or projected income, less certain expenses, is divided by a capitalization rate to determine the assessed value of the property. The sections below describe methods of determining the components of this formula:

A. Income

Mills Act contracts are unusual among preservation incentives in that tax benefits are available not only for income property, but also for owner occupied property. When a property is owner occupied, the determination of "income" is based on what a property could reasonably be expected to yield, or an amount stipulated in the contract as the minimum income to be used. The income projected for owner occupied property is based on comparable rents for similar property in the area or, if insufficient rental information is available, the income that it could reasonably be expected to produce under prudent management (See. Rev. and Tax Code Section 439.2(a)). In the case of income producing property, the income amount is based on rent actually received and on typical rentals received for similar property in similar use.

B. Expenses

The expenses to be deducted from income include those necessary for the maintenance and operation of the property. Typical expenses include insurance, utilities, repairs, and management fees. Expenses that are excluded include debt service, property taxes, depletion, and interest on funds invested.

C. Capitalization Rate

A capitalization rate is commonly used in the real estate market to determine valuation of property. This rate generally reflects factors such as property type and location and the quality of the income the property produces; it also reflects expectations of inflation, risk and return on investment.

The determination of a capitalization rate for historic properties under the Mills Act, however, is standard, regardless of the location or appreciation possibilities. In general, a higher capitalization rate will result in a lower valuation; for historic properties, the Mills Act capitalization formula results in a higher rate than would normally be found in the commercial real estate market, reflecting the intent of the legislation to provide an incentive for preservation.

The capitalization rate for both owner occupied and income property includes an interest component, an historical property risk component, an amortization component and a property taxes component.

- The **interest component** is determined by the State Board of Equalization by September of the year preceding the assessment year and is based on the effective rate on conventional mortgages as determined by the Federal Home Loan Bank Board. In recent years, this rate has ranged from 9% to 10.5%.

- The **historical property risk component** is 4% in the case of owner occupied single family dwellings. In all other cases, the property risk component is 2%.

- o The **amortization component** is a percentage equal to the reciprocal of the remaining life of the improvements. Although this calculation varies by individual structure, as an estimate, a typical remaining life of a frame building would be 20 years; for masonry buildings the remaining life might be up to 50 years.

- o The **property taxes component** is defined as the "percentage of the estimated total tax rate applicable to the property for the assessment year times the assessment ratio." Typically, this component will be 1% (.01 post-Prop. 13 tax rate x 100% assessment ratio). Special district assessments are not included in this component.

An example of the impact that a Mills Act contract could have on property taxes are shown in **Table 9-6.** It is important to remember that tax relief will vary by property and will require negotiation with individual county assessors. This table is provided as a sample calculation for a typical smaller unreinforced building. The example has been simplified considerably for ease of comprehension.

When considering the potential benefits of the historic property agreements, owners should be aware that they are not "costless." The process of negotiating a contract will take time and will most likely require attorney's fees. The assessed value of property under a Mills Act contract is recalculated each year to reflect changes in income, expenses, interest rate and amortization. It should be noted that over the life of the contract, the tax savings will increase as the market value assessment increases. In addition, in a case where the property has appreciated and is sold, the tax savings will be greatly increased for the new owner since the Mills Act valuation method will continue to be used, regardless of the purchase price for the property. A more complete description of the valuation of property subject to Mills Act agreements can be found in Revenue and Tax Code Sections 439.2 through 439.4.

<u>Properties For Which Mills Act Consideration Would be Feasible</u>

Because the Mills Act program is related to the assessed value of a property, only relatively recently purchased or improved buildings would potentially benefit significantly from implementation of this type of program. The degree to which the Mills Act program would offset the costs of retrofitting would differ for each building. However, assuming the objective of a Mills Act program is to fully offset the costs of a retrofit, several decades of participation would probably be required.

To determine how many building owners could potentially benefit from implementation of the Mills Act, the inventory of unreinforced buildings was reviewed to determine how many structures were purchased in the last ten years. Between 1985 and 1990, nearly 40% (61 buildings) of the unreinforced building inventory was sold at which time reassessment occurred. All of these ownerships could benefit from the program and some of the buildings purchased between 1980 and 1984 (25 buildings or 20% of the inventory) could benefit. Taken together, well over half of the City's unreinforced buildings could benefit from implementation of the program. **Table 9-7** presents the list of structures that would potentially benefit from the program. **If the Mills Act is used to offset upgrade costs, the consultant recommends that preference be given for structures upgraded to Level III standards.**

Mitigation Scope and Residual Effects

The mitigation measures outlined above are designed to lessen cultural resource impacts to insignificance. The proposed mitigation measures would actually enhance the quality of the streetscape and assure the long term preservation of a portion of the City's historic building stock. **Residual effects are non-significant.**

Table 9-6
Sample Mills Act Property Tax Calculation

Mills Act Tax Adjustment

The following is a simple example showing the possible tax benefits to the historical property owner of a small retail business. Assuming the current assessed value for a small unreinforced building is $300,000 and that a fair rent or income is $1200 per month (prescribed in Sec. 439.2 of the State Revenue and Tax Code).

First, determine annual income. $1200 per month minus approximately $200 per month for maintenance, repairs, insurance, water, and other expenses results in a net income of $1000 per month. Multiply by 12 months to get an annual income of $12,000.

Second, determine capitalization rate as follows:

> Determine loan mortgage (10.50%).
>
> Determine the historical property risk component of 2% (as prescribed in Sec. 439.2 of the State Revenue and Tax Code).
>
> The Tax rate (Post-prop. 13) of .01 times the assessment ratio of 100% (1%).
>
> Assume a remaining life of 20 years. Reciprocal of this is 1/20 of 5%.

Add these together: 10.50% + 2.00% + 1.00% + 5.00% = 18.50% Capitalization rate.

Third, the new assessed value is determined by dividing the annual income ($12,000) by the capitalization rate (18.50%) to arrive at the new assessed value of $64,864.

Last, determine the amount of taxes to be paid by taking 1% of the assessed value $64,864. Compare with current property tax rate:

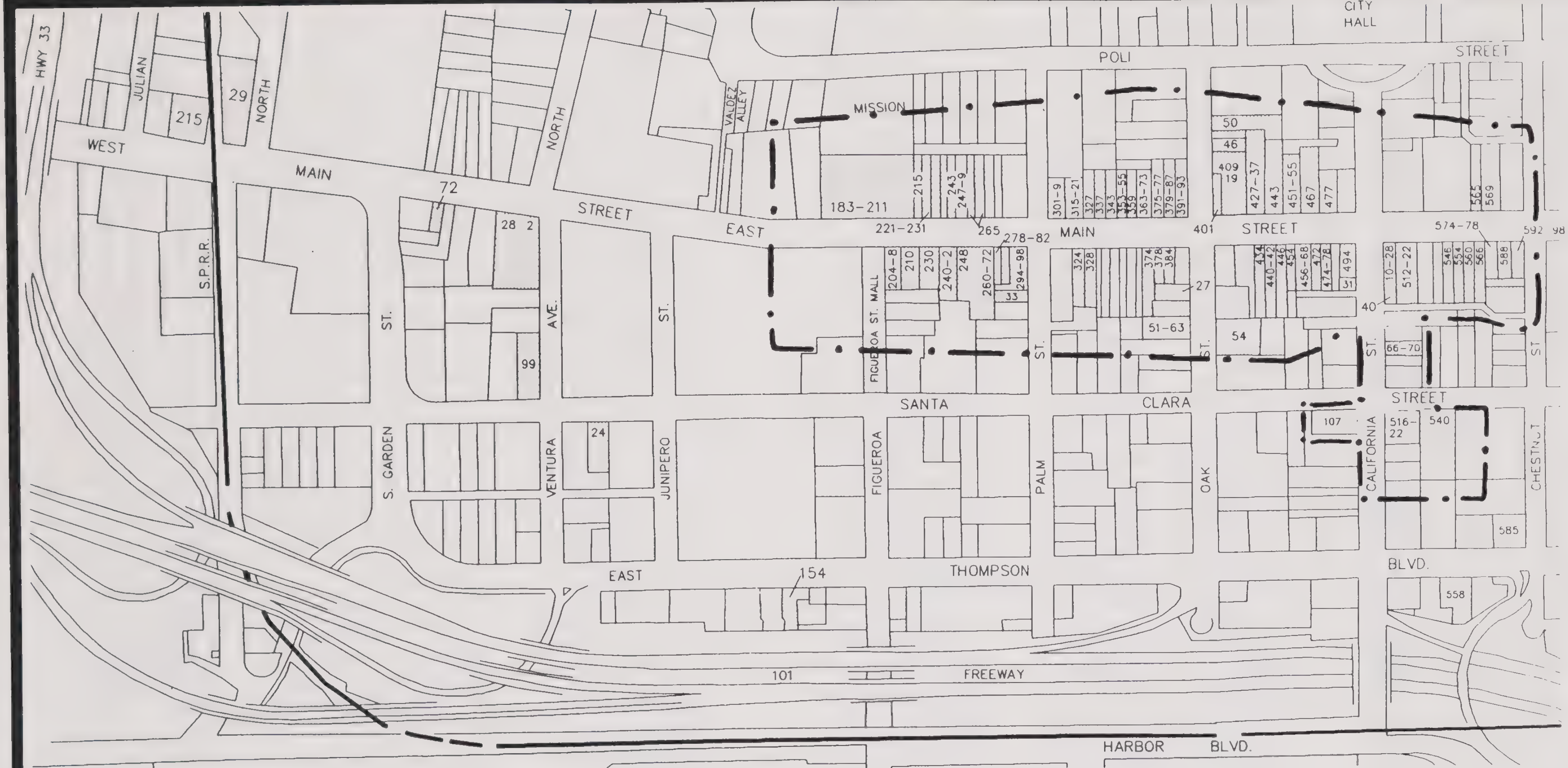
> Current property tax: 1% of original assessed valuation of $300,000 is ($300,000 x 1% = $3,000).
>
> Mills Act property tax: 1% of new assessed value of $64,864 is $648 ($64,864 x 1% = $648).

Savings of $2352 in annual property taxes.

TABLE 9-7

BUILDINGS POTENTIALLY ELIGIBLE FOR MILLS ACT BENEFITS

Assessor's Parcel Number	Purchase Date	Assessed Valuation	Est. Tax Liability
071-0-071-260	12/18/85	567,649	5,676
071-0-141-180	12/30/86	460,031	4,600
073-0-032-070	04/03/89	497,523	4,975
073-0-032-120	10/12/89	387,600	3,876
073-0-032-130	10/21/88	387,028	3,870
073-0-033-180	03/14/90	340,347	3,403
073-0-034-070	12/20/89	512,355	5,124
073-0-034-090	07/10/89	645,149	6,451
073-0-034-110	11/21/80	362,103	3,621
073-0-035-180	03/15/90	331,761	3,318
073-0-042-110	10/10/83	364,620	3,646
073-0-044-010	01/22/80	595,843	5,958
073-0-046-040	01/10/91	313,586	3,136
073-0-114-080	04/30/79	389,826	3,898
073-0-131-020	04/03/90	1,075,300	10,753
073-0-131-050	11/06/89	357,000	3,570
073-0-134-050	03/05/76	737,756	7,378
073-0-181-090	05/13/85	545,564	5,456
073-0-181-090	05/13/85	545,564	5,456
073-0-185-010	12/12/90	675,000	6,750
073-0-185-010	12/12/90	675,000	6,750
073-0-201-270	08/24/87	577,557	5,776
073-0-212-240	04/30/85	460,161	4,602
073-0-263-030	04/25/90	618,631	6,186
075-0-035-290	05/21/90	444,717	4,447
075-0-092-040	04/04/85	735,872	7,359
089-0-100-080	01/03/74	474,135	4,741



Recommended District Boundary for Coordinated Upgrades and Mills Act Eligibility

N

SCALE

500 FEET

Main Street Special District: Proposed Boundary

Unreinforced Masonry EIR

Figure 9-1

The *PLANNING CORPORATION* of Santa Barbara

CHAPTER 10

CONSTRUCTION EFFECTS: PHYSICAL IMPACTS ON BUSINESS ACTIVITIES, TENANTS, AND THE COMMUNITY

Revisions to the Final EIR in Response to Comments on the Draft

Additional information about the potential adverse effects of construction on building tenants was provided in this section in response to comments on the Draft EIR. Interviews were conducted with business owners in Ventura at locations where upgrades are currently being performed; this data supplemented similar information obtained from tenants in Ojai, Ventura, San Francisco, and Santa Barbara.

Some commentors questioned the average costs of building construction with continued occupancy. In response this concern, a review of cost premiums was completed for upgrading with occupants in place. A range of cost increases resulting from upgrading with tenants in place (for each upgrade option) were included in the revised text of this chapter. More stress was placed on the analysis of tenant effects if a **Level III** program is adopted.

Additional information about tenant disruptions was compiled from several sources. A substantial amount of information in this chapter was incorporated from the study of the potential economic effects of upgrading conducted for the City of San Francisco (Seismic Retrofitting Alternatives for San Francisco's Unreinforced Masonry Buildings: Socioeconomic and Land Use Implications of Alternative Requirements, Prepared for the San Francisco Department of City Planning, Recht Hausrath and Associates, Oakland, California 1990). Finally, in response to concerns raised by the County of Ventura, as additional discussion of potential waste disposal problems resulting from building demolition was provided.

10.1 Introduction

Chapter 5 of the EIR describes and illustrates the range of contemplated strengthening activities that could potentially be included in the ordinance to be adopted by the City. The illustrations accompanying the descriptions of these upgrading activities provide some concept of the type and degree of disturbance that is anticipated with each strengthening option. Disturbances to tenants and surrounding building owners will vary considerably depending on several factors including whether occupancy is continued during construction, whether additional remodelling is done coincident with strengthening, and other factors. The cost premiums (expressed as percentages) that continued occupation and remodelling will contribute to total upgrade costs are discussed in this chapter and in chapter 11.

Nearly any level of upgrading will result in inconvenience and the typical disturbance of construction including noise, dust generation, pedestrian inconvenience and business interference. Strengthening activities per se do not create any substantially unique or atypical construction problems; however, the presence of tenants during this upgrading process contributes importantly to the uniqueness of upgrade construction problems. Construction typical of an upgrade program in an urban setting is not an unusual occurrence, although the practice of complete renovation and restoration in a downtown setting is more familiar to residents of more intensely urban areas than cities such as Ventura. Safety, dust suppression and inconvenience reduction programs in densely populated, active urban areas with unreinforced buildings are familiar to most contractors with expertise in seismic upgrades.

In responses to the Notice of Preparation, several members of the public (including building owners) raised questions about the potential adverse consequences of upgrade construction activities on the downtown area and on business activities in particular. Where these concerns are applicable is primarily in the portion of the City between Figueroa and Chestnut along Main Street. Given the lack of contiguous structures and low pedestrian counts in other parts of the City where isolated unreinforced buildings are located, the problems related to upgrade construction in these areas would be similar to and typical of commercial or industrial

renovations and, to a considerable extent, new construction. Therefore, **the scope of the following discussion generally is limited to construction effects in the downtown Main Street corridor.**

The mitigation measures presented in the conclusion of the chapter are probably equally applicable to any level of strengthening but, depending on the scope of the ordinance ultimately adopted, some measures may not be necessary. Before discussing specific construction effects, a review of prior construction effects experiences on tenants and business owners in other cities is provided to put into perspective the physical impacts resulting from upgrading. Comparative data from Ojai, San Francisco, Ventura, and Santa Barbara are used to illustrate the range of problems that strengthening programs create for owners and tenants. Impacts of the construction period on various types of tenants are discussed first.

10.2 Impacts of Construction Period Disruption and Displacement for Building Occupants

The following discussion of construction period disruption was based on a socio-economic evaluation prepared for the City of San Francisco. An introduction to this issue was provided in Section 5.5 of chapter 5. The observations and conclusions regarding disruption to owners and tenants based on tenants in the San Francisco building inventory are directly comparable to conditions in Ventura.

There are many types of construction impacts associated with strengthening unreinforced buildings. Due to the wide variations in disruptions resulting from different levels of upgrading, it is not possible to quantify specifically the number of businesses or residents that would be inconvenienced by each type of potential construction impact for each level of strengthening. However, it is possible to describe the general range impacts resulting from each level of strengthening and to identify the types of businesses or residents likely to have the most difficulty during the retrofitting construction period. The dominant construction activities associated with each type of strengthening program being contemplated by the City are described in chapter 5.

The following discussion characterizes the severity of construction period impacts for building occupants. Business tenants are discussed first (by generalized business type); the tolerance of different types of businesses remaining in a building during retrofitting is directly related to the nature of the business in the building. The hardship imposed by temporary relocation (which would probably be required for a selection of buildings upgrade to **Level II** standards and for many **Level III** upgrades) depends on the importance of physical location to the business as well as on the availability and cost of alternative space. For residents, consideration of the characteristics of the population living in unreinforced buildings provides a basis for making conclusions about what physical hardships and cost premiums would result from retrofitting an occupied building.

The three major retrofitting alternatives are not referenced individually in the following discussion; the description of effects is generic and oriented to discussion primarily of **Level I, II and III** upgrades. Nearly all **Level IV** upgrades would require tenants to be temporarily relocated. The types of disruption and the relative magnitudes of disruption associated with each alternative were discussed in Chapter 5. Clearly, a **Level IV** upgrade would have the most severe disruption and business displacement while buildings are being retrofitted. Under a **Level I** upgrade, the retrofitting work would not be very disruptive, and it is unlikely there would be much displacement. **Level II and III** disruptions would range from minor to major disturbances, depending on building size and shape. The degree of hardship for building occupants associated with each alternative would follow that same relative ranking.

The following discussion is summarized in Table 10-1. This table displays the average costs per square foot, estimated project duration, duration with continued occupancy, level of interference with business activity, cost premiums for buildings occupied during construction, and average costs for upgrades with continued occupancy. Data in the table were derived primarily from Rutherford and Chekene's analysis of San Francisco building upgrade costs. **Based on the information contained in this table, it is clear that the Level I and II upgrades both have relatively small cost increases if tenants remain during construction whereas the Level III option can be quite disruptive and time consuming.**

TABLE 10-1

AVERAGE CONSTRUCTION COSTS, PROJECT DURATION, AND TENANT DISTURBANCES

Strengthening Level	Average Costs per Square Foot	Project Duration	Project Duration with Continued Occupancy	Interference with/ Temporary Relocation of/ or Suspension of Business Required	Percent Increase in Costs if Building is Occupied During Construction	Average per Square Foot costs with Continued Occupancy
Level I	$4.80	4 to 7 weeks	6 to 9 weeks	Rarely Required for more than 10 days	40%	$6.72
Level II	$6.58	7 to 12 weeks	12 to 15 weeks	Sometimes Required for Several Weeks	40%	$9.21
Level III	$10.54-$14.00	6 to 20 weeks	12 to 40 weeks	Often Required for up to a 2 Month Period	20 to 100%	$12.65-28.00
Level IV	$30.00	8 to 32 weeks	16 to 60 weeks	Nearly Always Required	70 to 100%	$60.00

Note: Cost premiums during construction are considered worst case estimates. In application, average cost premiums for Level III construction in Ventura would probably range from 30 to 50% Cost increases implementing Level III programs are highly variable depending on the type of business occupying a building. The largest increases (80 to 100%) are nearly always associated with residential buildings. More typically, cost premiums for retail buildings range from 30 to 40%.

Source: Rutherford and Chekene

The duration of retrofit programs also differs considerably by building prototype. **Table 10-2** displays the upgrade program durations for buildings included in the prototypes which comprise the Ventura inventory (illustrated in chapter 7 section 7.2). Most **Level III** estimates are based on conditions which would preclude continuous occupancy. **Based on this review of construction cost, project duration, and premium during construction, it is clear that a Level III program would have significant effects on business owners and tenants. These impacts include:**

- **loss of income for tenants resulting from business suspension;**
- **serious interference with business activities during construction; and**
- **potential loss of rental income for building owners from businesses that decide to permanently relocate rather than vacate and reoccupy a building.**

To a considerable degree, these adverse effects are unavoidable with a **Level III** upgrade. Offsets can be provided such as rent suspension, financial supplements during business closure, and provision of temporary locations for business operations but all of these offsets would be relatively costly both for business owners and tenants. **Adoption of a Level I or II standard would minimize both tenant and business disruptions.**

Discussion

Implications for Businesses

Hardships for businesses would result from retrofitting construction in the form of reduced revenues and/or additional costs. Revenues could be reduced to the extent that businesses close temporarily, lose use of a portion of their space for a time, or lose productive time because of the retrofitting. Examples of business losses and disruption based on survey data from Ojai and Santa Barbara are provided in a subsequent section. Loss of productive time would include situations in which substantial time would be required for relocation and/or construction related matters, as well as situations in which noise, dust, or other disruptions would limit or temporarily curtail normal operations. Additional costs would be incurred primarily by businesses that relocate all or a portion of their inventory or operations during the retrofitting. The costs could include moving expenses and, possibly, a cost differential in rent as well as the costs of additional advertising and/or mailings to clients and customers.

The significance of hardships for businesses not only depends on the type of business but also on the financial strength and resources of the individual establishment. Whether a business is small or large, undercapitalized, new, established, successful or more marginal, all influences the impacts of construction on business. Construction related hardships would mean less income to owners in most cases. For some small, marginal operations, the impacts could mean that owners may go out of business as a result of construction related impacts but such a situation is likely only to occur in a few cases. In the City of Ojai, City assistance was provided in some cases to disrupted tenants to minimize business disruption and losses.

Impacts on business operations could have implications for employees as well. Reduced business operations and/or reduced income could mean reduced employment and associated wages and salaries for a period ranging from 6 to 20 weeks, depending on the type of upgrade required. Business disruptions and cutbacks could include reduced staffing, temporary lay-offs, and/or forced vacations. Business closures could result in a loss of employment if a business is marginal.

Retail Businesses. Disruption from construction activities and the potential requirement to move out of the building for some or all of the retrofitting project would be most difficult for retail shops and stores, eating and drinking establishments, and personal services businesses. The retrofitting projects could compromise key elements of these businesses.

TABLE 10-2

DURATION OF RETROFITTING PROJECTS BY BUILDING PROTOTYPE (in weeks)

Prototype	Level I	Level III
1. Small, one story	5	4 *
2. Small, 2-3 story, residential	9	6 *
3. Large, one story	6	9
4. Small, 2-3 story, office/commercial	8	6 *
5. Large, industrial	8	12

* = Vacant. Duration is for work on building without occupants.

Note: The duration estimates should be interpreted as the minimum time required for the actual construction work performed efficiently by skilled workers who are well supervised. The duration estimates do not account for delays in timely inspections or material delivery. They also do not account for additional work that may be simultaneously undertaken or for the time involved with project planning, design, testing building materials, or obtaining permits. The duration estimates do not account for time premiums for work on historically or architecturally significant buildings. Depending on the prototype and the alternative those premiums would range from 2% to 30% more time.

SOURCE: Rutherford & Chekene

Retail stores and eating and drinking places are dependent on visibility, pedestrian traffic and maintenance of a pleasant environment. On-site disruption from construction activity would mean reduced visibility for merchandise or signs. The dusty aspects of a retrofitting project also could damage merchandise or make it less appealing to customers. The dust and noise would be particularly burdensome for businesses selling or preparing food and for establishments offering a relaxing, comfortable dining experience. Since many of the businesses in this group are open during the day and night, it would be difficult to schedule the retrofitting work to avoid conflicts with business operations.

Although the on-site disruption of retrofitting activities would cause serious problems for retail businesses, experiences in other cities has demonstrated that most businesses choose to remain at their current locations and endure the situation, to the extent possible, in spite of having to scale-back operations, rather than relocate to other space. For those business owners or tenants with no choice because the retrofitting project would pose constant and serious disruption, relocation could be a very difficult and unpopular option.

The length of time required for relocation would be an important factor in a business owner's decision to remain or relocate. If the business were only required to be closed for two to four weeks, the burden of lost sales would be relatively small and the business owner would probably remain and use the weeks of lost income as a vacation period. If the business was required to be closed for a longer period of time, an owner may be forced to seek an alternative business location. For owners who had to relocate, the availability of suitable space in the same general vicinity would be a key requirement which may be difficult to meet.

Location is particularly important to retail businesses. Depending on the business, location can be important in terms of proximity to customers (residents, visitors, workers), accessibility (via auto/proximity to parking, via public transit), and being part of an established retail area (such as the Main Street corridor). Local-serving businesses are particularly dependent on location because proximity and convenience are a large part of what they are selling to the public. Especially if an establishments' goods and services are not particularly unique (e.g., stores selling grocery items or liquors, video or record shops, sandwich shops and delis, etc.), businesses that cannot find suitable nearby locations could lose customers who would find other, more convenient alternatives. Businesses serving a larger market area may have more flexibility in relocation, although for larger businesses, a location in an established retail area could remain an important determinant. Depending on the availability of alternative locations, more specialized businesses with an established, loyal clientele may be better able to relocate than newer businesses and those in more competitive lines of businesses.

The nature and suitability of alternative facilities also is important to some retail businesses. Eating and drinking places as well as some retail stores and shops depend on the ambiance of the surroundings that have been created by extensive interior improvements to their space. In addition, there are eating and drinking places and personal service establishments that require specialized facilities and equipment (kitchens, hair dryers and sinks, dry cleaning racks and equipment, etc.). Thus, for some retail businesses, it may not be possible to operate in alternative space without making very substantial leasehold improvements. As a result, temporary relocations may not be possible (so that owners would close for a time rather than move) or may require permanent relocations to justify the costs of leasehold improvements.

In some situations, retail business owners would be able to find suitable vacant space in the same general vicinity and would be able to re-open with minimal loss of sales and customers. While the availability of space would not be a problem, those businesses might end up paying more for rent than they otherwise would have, at least for a period of time.

Finally, as discussed in section 10.6, construction activities may displace on-street parking (particularly along Main Street) during the demolition and initial reconstruction phases. Depending on how strengthening is coordinated in the downtown core, parking dislocation could be potentially disruptive for retail businesses. The mitigation measures included in this chapter should adequately offset any loss of business this problem may generate.

Hotels. Similar to retail establishments, tourist hotel operations would be extremely sensitive to the disruption of retrofitting work. Essentially, hotels market an environment, and potential hotel guests have a range of options from which to choose; it would be virtually impossible to attract and retain customers during a noisy and dusty seismic retrofitting project. A hotel operator would not have the option of relocating during retrofit. Therefore, depending on the extent of the work, unreinforced masonry hotels would be subjected to disrupted operations for the duration of the retrofitting project. If the work were scheduled for the off-season, the financial impact from lost bookings would be minimized because vacancies would normally be high during winter months. This offset would not be available for low cost or single room occupancy hotels that are not oriented to seasonal recreation.

Office Businesses. The nature of office businesses generally means that they could tolerate retrofitting work more easily than retail or hotel businesses. By contrast to those establishments, office businesses are not as dependent on proximity and accessibility to customers or on the quality of the environment in which they operate. Management and administrative functions, communications, record-keeping, and creative work could be maintained under the conditions of a retrofitting project, while sales and customer service might need to be relocated temporarily. By contrast to retail establishments that would risk losing business as a result of the disruption of retrofitting, office businesses would primarily be concerned that employees be allowed to continue to work. Therefore, for some period of time, office operations would be consolidated and moved from one place to another within a building, while the retrofit work passed through the interior space. While there might be less productivity for a time, work could continue. Sensitive office machines might be difficult to protect during retrofitting. Some offices may have a lot of sensitive equipment, in which case the retrofitting project would be more difficult to manage with continued occupancy.

Some office businesses would have to relocate for the more extensive retrofitting projects. There are more space options for office tenants (generally higher vacancy rates and less dependent on location) than there are for retail tenants, so it would not be as difficult for office businesses to find suitable alternative spaces as it would be for retail businesses. Some former office tenants of unreinforced buildings would probably have to pay higher rents for space, however. Some businesses, forced to move out for a long period of time, might decide to make permanent moves.

Garages. The types of businesses located in garages (auto and other repair establishments, auto sales, supply, and service establishments) generally would not be very sensitive to the disruption of retrofitting activities, similar to many industrial and warehouse businesses. One- and two-story garage-type structures, because they are relatively small buildings, could be upgraded in a relatively short time period (one to two months). The businesses located in these types of buildings are not a type of business that could easily relocate. While their space is relatively simple, the businesses have some basic requirements that are not easily duplicated. Moving tools, equipment, and inventory would be difficult. These businesses are also relatively location-dependent, serving a neighborhood clientele or contributing to a cluster of related repair, parts supply, and service establishments. For all those reasons, auto-related and similar businesses would tend to simply close for the duration of the retrofitting project instead of relocating. Since the duration of retrofitting projects for that type of building would be relatively short, the costs to business owners, in terms of lost sales, may not outweigh the costs and risks associated with relocation, especially given the limited options available.

Implications for Residents

Hardships for Those Who Have to Move Out. As discussed above, some buildings are likely to be vacated for retrofitting projects under **Level III** upgrades and nearly all buildings would be vacated to implement a **Level IV** alternative. In addition, some tenants might move out of other buildings if they could not tolerate the disruption of living with the retrofitting project. Those tenants would tend to be households that could readily find alternative living arrangements. The experience of residential tenants who have to move out would be different from the experience of those who continued to live in buildings while the construction

work was underway. Both would face some hardships, though of different types. Relatively few of the City's unreinforced buildings include residential occupancies. **In general, compared to other cities in southern California, only a very small number of unreinforced buildings are being used for residential purposes.**

Not all tenants who would move out of their building for the duration of the retrofitting project would have the same problems with relocation. Some people would move in with family or friends; for some households, that would be a relatively simple solution; for others it would be a last resort if no alternative housing could be found. Finding alternative housing for the duration of the retrofitting project would be extremely difficult for some tenants; for others, it might be impossible. Although tenants with leases would probably be eligible for relocation payments to defray the costs of moving, storage, and additional rent during this time period, many of the households living in unreinforced buildings have limited housing options and may not be able to locate somewhere else to live, particularly without assistance. Lower income households would have difficulty finding units they could afford. Families would also have difficulty finding suitable alternative housing; while many already live in overcrowded situations, the over-crowding might be worse during the retrofitting period. The hardships could be most severe for elderly tenants who would be likely to be long-term tenants and would not easily accept the temporary dislocation caused by the retrofitting program. Elderly tenants might be ill or disabled and they would almost certainly have only limited income. Those factors would compound the psychological difficulties associated with relocation. Language barriers would be another factor exacerbating the difficulties faced by some residents who need to relocate. It would be difficult for individuals who did not speak or understand English to comprehend what was happening to them and to their home--to understand the benefits of seismic retrofitting and the reasons for temporary relocation.

Tenants of single room occupancy units in residential hotels are also a special case for concern. At a certain level, the disruption associated with the retrofitting program would be less of a problem for those people, because many are, by definition, more transient and thus would not be as troubled by the need to temporarily relocate as would residents who had been settled for a long time in one place. On the other hand, tenants of single room occupancy units have few, if any, other housing options. Many also are dependent on the social services provided nearby. If a large number of those units were vacated at any one time to undertake the retrofitting work, there would be a serious short term housing shortage for these types of tenants.

Hardships for Those Who Stay. Residents who remain in a building during the retrofit period would not have to contend with the problems of finding alternative housing. For that reason, even with the potential for reimbursement for moving expenses, residents who have few other housing options would attempt to stay in the building to be upgraded. Those who stay would have another set of problems to contend with. Residents living. through a retrofitting project would face construction dust and noise and might have to move within the building or close off part of their living quarters for some part of the retrofit period. The construction work would be shielded from residents for the most part, in attempts to minimize disruption. Elderly tenants, potentially those most likely to have to remain in the building, would also probably suffer the most from construction disruption. They might be more sensitive to dust, noise, and drafts; moreover, by contrast to younger tenants who would probably be working, elderly residents would be more likely to be in the building most of the day while the work would be going on.

10.3 Socio-Economic Effects of Construction from the Tenant and Owner-Tenant Perspectives: Experiences in the Cities of Ojai, Ventura, and Santa Barbara

The City of Ojai coordinated upgrading a downtown arcade comprised of thirteen contiguous unreinforced buildings that are situated in the downtown retail portion of this City. The consultant selected Ojai as the appropriate model for predicting the Ventura construction experience for three reasons: 1) the retail uses in the Ojai arcade are typical of downtown Ventura along Main between Figueroa and Chestnut; 2) the size and scale of the buildings in the two cities are nearly identical; and 3) the Ojai upgrade requirements are very similar to the Ventura Level II upgrade. Although less optimal as a model for future experiences in Ventura, construction effects on tenants in Santa Barbara were also summarized. Both comparative studies

were based primarily on interviews with building owners and tenants. The upgrade standard for both of these cities are less comprehensive than the Los Angeles Division 88 ordinance (discussed in a cursory manner in Chapter 4).

The Ojai Upgrade Program

The City of Ojai's upgrading program was a 1.75 million dollar undertaking involving thirteen property owners. Of the total reconstruction cost, business owners contributed approximately $600,000 (or $46,000 per building owner) and the remaining $1.15 million dollars was allocated by the City. Building owners in the arcade where upgrading was required paid for individual building retrofits. The City funded the arcade reconstruction and anchoring of individual structures to the arcade. Most of the buildings in the inventory had open store fronts.

According to the City of Ojai (letter of Andrew Belknap, comments and responses), the project elicited opinions both supporting and disputing the necessity of the program. The project had considerable public support. A volunteer fund raising entity, The Friends of the Arcade, raised over $80,000 towards completion of the project. Nearly 300 individuals, businesses and families contributed funds to assist in completion of the project. Compared to state-wide experiences, the Ojai program is considered a creative and successful example of a seismic mitigation program.

Technical standards used for the Arcade Rehabilitation project were based on the ABK methodology (now incorporated into the State Model Ordinance) modified to resist an effective peak acceleration of .3g. This criteria is nearly identical to Ventura's **Level II** standard. Strengthening work included parapet bracing, wall anchorage, diaphragm shear bolting and interconnection between measures related to Arcade stabilization. The upgrade standard provides a roughly equivalent level of life safety protection to the Los Angeles Division 88 Standard (taking into account the lower seismic risks and anticipated lower peak ground accelerations anticipated in Ojai). The primary objective of the Ojai program was life safety mitigation not building damage reduction.

The coordination of the funding effort, which included assessments from designation of a Landscape and Lighting Act District, and creation of a Special Benefit Assessment District, was performed by the City. Building owners paid for their fair-share contributions by 1) acquiring commercial loans, 2) using cash payments from capital accounts, or 3) obtaining low interest federal FMHA loans. Because public works projects in the City of Ojai are subject to prevailing wage provisions, use of this labor reimbursement standard increased the upgrade costs. The construction involved a floor and wall, and parapet anchoring program, reroofing, tying together contiguous buildings at the roof, and anchoring the individual buildings to a reinforced arcade comprised of piers and arches. Design standards were conceived to comply with Seismic Zone 2 standards. Planning Corporation staff interviewed nearly all of the tenants in the arcade. Business owners from whom data were collected included:

1. Ojai Village Pharmacy
2. Ojai Table of Contents
3. Ojai Ice Cream
4. Ojai Jewelry Creations
5. Time Portal Books
6. Rains
7. Fitzgerald's
8. Ojai Realty
9. The Hub
10. Blue Sky Music
11. Helga & Helmutt
12. Running Ridge

13. Camp Ojai
14. Ojai Body Works
15. Ojai Indian Shop
16. Jessica
17. Jovanne's Deli

Of these tenants, 13 provided detailed responses to the survey questionnaire.

Business Interference, Closures, and Compensation

The Ojai survey involved systematically interviewing most tenants within the boundary of the upgrade area. Based on an analysis of the total sample of 16 business owners interviewed, the following conclusions were derived:

(1) 50% of the businesses had to close for a period of between 3 and 30 days;

(2) No businesses experienced more than a one month loss of revenue;

(3) No businesses received income loss compensation from the building owners, the City, or insurance companies;

(4) About 35% of the business tenants had to temporarily relocate inventory and 12% had to remove inventories completely. A small percentage of the businesses that were forced to relocate store inventories were assisted by the City; and

(5) About 30% of the businesses had to use only a portion of their floor space during the construction period.

Business revenue losses were significant during the upgrade period. Nearly 80% of the business tenants experienced income reductions of at least 50% below normal volumes. Revenue losses ranged from a 20 to 80% reduction for the months of concentrated upgrade work. A deli-restaurant and special service short order business experienced the smallest business volume reduction (about a 40% reduction below average levels).

Other Business Losses and Construction Problems

Over 80% of the businesses in the sample experienced other types of losses not directly associated with revenue reduction. These losses resulted in frustration, inconvenience, stress and conflicts. The primary problems identified by tenants included:

- two burglaries through open roofs;
- eight businesses were damaged (carpets, floors, inventory) due to rain leakage during the repair period (caused by unseasonably early rains);
- shoplifting increased due to inventory disruption;
- several air conditioners were damaged during roof repair and resheathing;
- one business was damaged when a worker fell through a roof membrane;
- signs were damaged, several windows were broken, and tenants' and customers' cars received flat tires and mirror damage.

As expected in construction settings with businesses remaining open, damage and inconvenience was characteristic of the situation rather than the exception. Insurance claims were paid promptly by the contractor's carrier regarding clear cases of rain damage and negligence. However, other claims took months to settle and some claims are still in the process of being resolved. Given the experiences of business owners in the City of Ojai, construction effects on tenants and owner-tenants in Ventura are anticipated to be significant.

The consultant was not anticipating the degree of business owner dissatisfaction expressed in Ojai. Compared to experiences in other locations inventoried by the consultant (Santa Monica, San Francisco, Santa Barbara), the Ojai experience can and has been improved upon in other areas. In Ojai, business owners complained that the City had taken the lowest bidding contractor and, as a result, sufficient care was not taken in expediting and coordinating the work. Roof sheathing, for example, was removed for a period of nearly two months during the rainy season. The overrun in construction time extended into the retail Christmas season. Signage did not clearly indicate which businesses were open and which were closed. In most instances, store entries had to be transferred from the street corridor to a rear alley corridor. The duration and methods of construction were not clearly explained to the tenants.

Business owners expressed several other dissatisfactions. Complaints were expressed regarding the relatively low level of earthquake damage security provided by the upgrade. As interpreted by some business owners, the strengthening program was sufficient to enable buildings to withstand only relatively minor earthquakes and there were questions raised regarding the legitimacy of completing only a minor upgrade given the potential force of local ground accelerations. The range of editorial comments regarding the upgrade work spanned the range from strong disapproval to moderate satisfaction. Considerable dissatisfaction, though, was uniformly evoked regarding questions about the pace and duration of the work.

The overall effect of the upgrade has been aesthetically and financially rewarding for the City and its business tenants. In comments of the Draft EIR, City Manager Andrew Belknap stated: "while I would not want to minimize this concern [temporary business disruption], it is one that must be balanced against the very real public safety and economic risks associated with unreinforced masonry buildings in earthquake prone areas. I must say that the Arcade project has been completed, we have some significant private investment in the commercial buildings, and the area is busier than ever. Generally the project seems to have had a positive long term impact on the downtown economy."

<u>The City of Santa Barbara Program</u>

The City of Santa Barbara's approach to upgrade requirements is based on a modified UCBC design standard (explained in Chapter 4) with exceptions 1) enabling use of State Historic Building Code standards for historically significant structures and 2) permitting moderate risk buildings to have further reductions in compliance with UCBC standards. As explained in Chapter 4, the first exception may well have the consequence of enabling lower levels of strengthening for the most important historic and architecturally significant buildings in the City resulting in building losses in a moderate to strong quake. The second exception would result in reduced strengthening for buildings with lower occupancies. The City was sued regarding the adequacy of the adopted standard (given the City's location in a high risk earthquake area - Zone 4). The result of this lawsuit was a modified upgrade standard encouraging more strengthening.

The ordinance and implementing resolutions established a five district system and full upgrade compliance is required within all districts by 1996. The district approach encompasses spans of between 2 and 4 City blocks where upgrade work is to be coordinated on an annual basis. This approach to the problem encourages upgrade coordination and concentrates construction inconvenience into confined one or two block areas.

A substantial amount of upgrade work has been done coincident with the recent extensive downtown redevelopment effort coordinated by the City. Nearly all of the upgrade work related to redevelopment construction was performed with tenants either temporarily relocated or by simply terminating tenant leases in anticipation of obtaining increased revenue from leases with new tenants attracted by the redevelopment

mall project, Paseo Nuevo. In the older El Paseo built in the 1920's, smaller businesses have generally either relocated or been closed for the duration of the seismic upgrade work. This situation is due in part to the nature of the renovations and the smaller size of businesses in El Paseo. The El Paseo strengthening program has emphasized exterior building surfaces and interiors. Considerable remodelling is being done coincident with strengthening.

Tenant reactions in Santa Barbara have been more diverse and wide ranging than the experience documented during interviews with building tenants in Ojai. Typical responses and reactions included:

- Major upgrade work on a typical, large, two-story structure, the Bank of Montecito, was completed coincident with new construction of an expanded bank headquarters. The old and new buildings were tied together and business interruption was relatively minor.

- City estimates of upgrade costs (between $2 and $10 per square foot) were in error by at least 100% - actual costs have ranged from $15 to $25 per square foot.

- Building owners are attempting to coordinate the upgrades with tenant interior improvements where possible - especially for long-term tenants.

- Conflicts have arisen over lease interpretations. Some owners have obtained tenant leases which have been interpreted as requiring tenants to pay for the upgrades, rather than building owners.

- Business interruption in stores that do stay open during the upgrade have been significant. Business interruption has been minimized in larger buildings (such as Lanz of California and Pier I Imports) where adequate room is available to concentrate inventory while the upgrade work is in progress in the remainder of the building. Larger businesses have reported minor reductions in income and some owners have reported actual business increases (due in part to seasonal buying trends) during the upgrade process.

The economic effects of the upgrade program in Santa Barbara are not directly comparable to experiences in Ventura because the Santa Barbara downtown business core is substantially more diverse, aggressive, and successful than Ventura's Main Street corridor. Therefore, it is reasonable that the adverse business effects in Santa Barbara are less significant than consequences anticipated for Ventura or conditions reported in Ojai. It is also important to note that a relatively large number of Santa Barbara upgrades have been completed without occupants in place. Having reviewed the general business disruption effects of upgrade construction, the physical effects of the work are described next.

Upgrades in the City of Ventura

Several upgrades have recently been completed or are currently in process in Ventura. In response to comments on the EIR, interviews were conducted with business tenants currently experiencing upgrade programs. The owners of **Franky's Place** (William and Kris Haldane), a business occupying a building currently being upgraded to **Level II** standards, indicated that the upgrade program has resulted in very considerable disruption to business activities and loss of revenues. Walk-in pedestrian traffic was seriously diminished by the extensive sidewalk scaffolding on the front of the building. Revenue losses were estimated to by about 30% over a fifteen week period. The business decline effected the wages of 18 employees. The owners, in retrospect, indicated that the business should have been closed more frequently to minimize costs during construction. The upgrade program itself only required business closure for one day. After completion of the upgrade, business volumes returned to pre-upgrade conditions. The owners also indicated that nearly continuous difficulties were experienced with the contractors performing the work; neither the building owner nor the contractor provided information about work schedules, activities, and related matters which would have assisted the tenants in deciding whether to remain open or not on a day by day basis.

These owner made the following suggestions about how to minimize the effects of construction:

- o **provide a system of fines or penalties for the contractors if the construction goes on longer than planned, and**

- o **the City should provide a construction liaison to coordinate complaints and to enforce some form of scheduling between the tenant, the building owner, and the contractor;**

The owner of **Rains Shoes** (Ron Maxey) indicated that construction scaffolding and upgrade work continued for a period of nearly 90 days during which time pedestrian traffic was disrupted and building signage was covered. The owner observed that older people, in particular, had difficulty using the store during the upgrade. From initial work through completion, the period of construction disturbance was over one year due to changes in the implementation of the upgrade. Several plan changes extended the upgrade period considerably. The business did not have to close but revenues declined by about 35%. Since the interview was conducted just one week after completion of the upgrade, business activity had not yet recovered. Contacts with the construction contractor were minimal and not sufficient to enable daily or weekly business planned. This tenant suggested that the City consider the following measure:

- o **a streamlined process for approving plan modifications should be established to minimize disruptions in buildings where plan changes are necessary.**

The **Marquez Barbershop** in the Allen Furniture Center, like the other owners interviewed, indicated that construction disruption extended over about a three month period. As in the case of other tenants, the business remained open but a significant loss of revenue resulted; this tenant estimated business losses to be about 40% of pre-construction revenues. Specific disruptions included: construction activities permitted the use of only a portion of the leased space during the upgrade; business losses resulted from the front entry scaffolding placement and inconvenience to pedestrians; bothersome levels of noise and some hazards due to falling interior concrete and wall surfaces. Relationships with the contractors (BMP Construction) were generally cooperative. The contractor made considerable efforts to minimize disruption which lessened the sense of inconvenience and disruption experienced by the tenant. This owner recommended the following mitigation measures to minimize construction effects:

- o **prior to initiation of construction, a schedule of activities should be drawn up and the tenant and contractor should coordinate regularly regarding planned activities;**

- o **dumpsters should only be permitted out of the flow of business and pedestrian traffic (either to the rear or on the side of building not exposed to pedestrian movements);**

- o **a pre-construction conference should be held between the contractor, the tenant, and the workers actually performing the upgrading; and**

  all construction barriers should be planned to keep the building entrance and signage visible.

Based on the interviews conducted in three cities concerning the disruptions that resulted from various types of strengthening programs, it is evident that **Level III** strengthening would be very disruptive to occupants remaining in a building. **Level II** upgrades were also disruptive; in Ventura, business tenants experienced a 30% to 40% revenue loss during the upgrade process. The duration of the upgrading programs were, on the average, about three months. These data confirmed the information obtained from other cities in southern California. Numerous suggestions were made by tenants which could significantly reduce tenant disruptions

if a **Level I or II** standard is adopted. These recommendations have been incorporated in the recommended mitigation measures.

Having discussed the physical impacts of construction on tenants, the following section was prepared to address specific construction effects anticipated with the adoption of any upgrading standard.

10.4 Issue 1: Asbestos Abatement during Demolition and Construction

Adoption of an ordinance would have only limited potential to result in the release of asbestos through both demolition (which may be an indirect consequence of an ordinance) and renovation activities. **Demolition related asbestos releases were a problem in the aftermath of the Loma Prieta earthquake and, for some buildings, compliance with Federal standards required special demolition techniques, public exposure setbacks, and intense dust suppression measures.** This problem would need to be confronted even if no strengthening ordinance is adopted (subsequent to an earthquake). However, rather than confronting the asbestos problem in an orderly manner enabling full protection of the public and demolition contractors, in the aftermath of an earthquake, as demonstrated by Watsonville's experience in the Loma Prieta quake, asbestos remediation is not a primary post-earthquake concern and airborne dust contamination is difficult to control in the post-earthquake setting.

Asbestos use in unreinforced masonry structures is not as serious a problem as contamination in structures built after about 1940. **Most unreinforced buildings were decades old before asbestos became a popular insulating, roofing, or building surface material.** As a demolition related problem, asbestos is usually found in low frequency in some commercial retail, industrial, and warehouse uses. Buildings that had extensive interior remodels in the 1940s, 50s, and early 60s are the types of unreinforced buildings with a higher potential for asbestos remediation prior to demolition or renovation. Both Federal and State laws govern the removal and disposition of asbestos.

Since most unreinforced buildings were constructed prior to the extensive use of asbestos as a structural or insulating material, asbestos remediation is considered a relatively insignificant construction related problem if an ordinance is adopted. Asbestos contamination would be more extensive if a moderately strong earthquake results in the need to demolish structures. After an earthquake, the orderly inventory and removal of asbestos is difficult (if not impossible).

Nonetheless, even though asbestos contamination is considered a very minor problem, a mitigation measure has been recommended to minimize asbestos risks to the extent feasible.

10.5 Issue 2: Construction Noise

Depending on the amount of upgrade work that is ultimately required, sources of potential noise could include hammering, a range of demolition activities, drilling, welding, the use of pneumatic tools, sandblasting, cement fabrication or guniting, and other activities typical of building construction. The anticipated construction noise effects for most levels of strengthening are relatively similar. The noise levels experienced should be considerably less than new construction in the same building locations. The noise would also be less sustained than for new construction. **Noise inconvenience is a universal phenomenon for any building construction program and is not unique to strengthening programs. The potential for noise inconvenience is considered a significant impact subject to mitigation. The effects of this impact would be of short duration.**

Normally, construction hours are limited to daylight hours, 7 A.M. to about 5 P.M. Monday through Friday. Since some building owners and tenants may opt for construction programs that minimize disturbances during business hours, evening or weekend construction should be permitted. However, off-hour construction should only be allowed when conflicts with and inconvenience to nearby residential and retail areas can be avoided.

To a considerable extent, as is the case with other construction effects, noise impacts are apt to be most intrusive in the portions of the Downtown Community where a large number of contiguous unreinforced buildings are located. Many of these contiguous buildings have shared (party) walls which will necessitate disturbances in both the building being upgraded and immediately contiguous structures. **The problems of construction noise contribute to the need to coordinate upgrades in blocks of contiguous structures.** This coordinating issue is discussed in more detail in Chapter 12.

10.6 Issue 3: Dumpsters, Dust, Odors, and other Minor Inconveniences

Many of the construction activities involved in strengthening unreinforced buildings involve reroofing and reframing roof supports. With the exception of remodels performed coincidentally with upgrading, reroofing would be one of the major sources of material demolition. Large dumpsters would not necessarily be needed at all construction sites unless reroofing or remodelling beyond upgrade requirements is performed. **The placement of large dumpsters along primary business corridors for the accumulation and removal of demolished materials may be a significant problem along the Main Street corridor.** Pedestrian movements would potentially be temporarily disrupted during the demolition and materials delivery phases of construction. Along the Main Street corridor, temporary inconvenience may result from:

- dumpster storage,
- materials delivery,
- displacement of parking,
- sidewalk closures,
- traffic diversion (short-term), and
- pedestrian movement restrictions.

All of these problems would be exacerbated by failing to conduct a coordinated upgrade program along the Main Street corridor. These sources of inconvenience would be minimal to virtually non-existent for nearly all construction sites where unreinforced buildings are free-standing and where adequate room is present on a parcel to plan demolition accumulation and material storage. Based on the consultant's field review of the City of Ventura building inventory, pedestrian inconvenience and adverse construction effects on adjacent properties would be very minor for about 50 to 60 percent of the inventory. **Only in areas of contiguous buildings along streets with heavy vehicle and pedestrian traffic will these problems become a serious, short-term inconvenience. As is the case with other construction effects, problems related to these inconveniences are anticipated to be of short duration.**

One of the most irritating construction problems experienced by both business tenants and pedestrians is the generation of dust and particles of plaster, cement, and other light, airborne materials. The problem reoccurs daily during the construction period and dust can be destructive of business machines, clothing, paper, and other retail items. Considerable improvement in tool technology (including vacuum attachments for some types of saws and planers) has resulted in some reduction in dust sources, but airborne particles, particularly during demolition, are a substantial problem when buildings are located immediately adjacent to one another. **Dust generation related to building demolition and some upgrading activities constitute a potentially significant problem requiring mitigation.**

Odors are not anticipated to be a significant problem. Occasional asphaltum heating associated with reroofing is anticipated but the scope and duration of this inconvenience is considered a minor and non-unique problem.

In comments on the Draft EIR, the Ventura County Regional Sanitation District expressed concern that adoption of an ordinance could potentially accelerate the rate at which buildings in the City would be

demolished. The District requested some analysis of the amount of disposable material that may result from ordinance adoption.

Attempting to estimate how many buildings may be demolished as a result of implementation of an upgrading program is a relatively complex question. Depending on whether an ordinance requires voluntary or mandatory compliance and depending further on the level of strengthening required, building demolitions could range from virtually no demolition to loss of 7% to 10% of the inventory. The economic impact of various levels of strengthening and the equity which an owner has in a building are other variables that would effect the number of demolitions that may occur. In brief, with the exception of an ordinance that requires building demolition, it is not possible to estimate with precision what tonnage of material for disposal would be generated by the various ordinance options.

In addition, discussion of related issues in chapter 9 of the EIR revealed that the rate at which unreinforced buildings have been demolished in Ventura without an ordinance is greater than the rate typical of cities with adopted ordinances. Currently, about one building per year is demolished in Ventura (based on a 20 year average from 1970 to 1990). The City currently has no requirements that bricks be recycled; salvaging bricks rather than disposing of them in landfills could substantially the per building waste generation resulting from building demolitions. **Although a mandatory recycling program for bricks would increase demolition costs substantially, resale of bricks could offset some portion of the increased demolition costs. The City could encourage private contractors to pursue brick recycling as a source reduction measure.**

10.7 Issue 4: The Duration and Organization of Construction

The ordinance proposals previously considered by the City included phasing programs that lasted nearly a decade. Recently adopted ordinances (such as have been implemented in West Los Angeles and other cities within the County of Los Angeles) require nearly immediate action by building owners. In communities with relatively small numbers of buildings, accelerated programs are common. Santa Barbara has followed the lead of several other jurisdictions in phasing the ordinance by blocks and enabling the less economically viable blocks of the City to be upgraded last. The Santa Barbara construction district arrangement will take five years to fully implement.

In comments on the Notice of Preparation, building owners criticized the City's interpretation of construction effects as short-term. This criticism has some validity. Depending on the ultimately adopted phasing program, construction effects could be sustained. However, the impacts of construction can be substantially reduced by adopting a construction district system similar to the one adopted by Santa Barbara.

The specific advantages of the construction district approach include:

(1) the pedestrian and traffic circulation effects of the upgrade program can be coordinated and concentrated to minimize disruption to owners, tenants, and the public;

(2) the physical impacts of construction (noise, odor and other nuisances) can be minimized and disruptions to adjacent tenants can largely be avoided (since all upgrades in a single block would be done at the same time);

(3) coordinated and shared use of dumpsters, simultaneous materials deliveries, effective pedestrian-corridor signage, and off-hour construction (which can minimize business disruption and increase the pace of work) is possible with block by block construction programs; and

(4) problems related to vandalism, fire, maintaining building security, and police protection can all be far more easily controlled if the zone of construction activity is circumscribed in a bounded, block size area.

Without some type of upgrade timing coordination, particularly in the downtown Main Street corridor, the adverse consequences of sustained construction activities would be significant and potentially long-term.

10.8 Issue 5: Construction Effects on Business Tenants

Section 10.3 of this chapter includes a complete discussion of construction effects on building tenants based on experiences in Ventura, Santa Barbara, Ojai and other cities. Based on this data, the consultant determined that construction effects on tenants during a **Level III** upgrade would be very disruptive; in many case, businesses would have to close for several weeks to several months during the upgrade. Impacts on tenants if a **Level I or II** program is adopted would be less severe but business losses, temporary relocation, temporary closures, and loss of income are anticipated, particularly with a **Level II** program which requires considerable interference with the building facade which faces the street. **Construction effects on tenants for all upgrades except Level I are anticipated to be significant, disruptive, and, in some cases, financially critical.** A number of mitigation measures recommended by tenants can effectively reduce the inconvenience of adopting either a **Level I** or **Level II** program.

10.9 Mitigation Recommendations for Construction Effects

Issue 1: Asbestos Remediation

(1) **If deemed warranted and at the City Building Official's discretion, prior to issuance of building permits for strengthening or demolition permits for building removal, an asbestos evaluation shall be performed by a qualified consultant to determine what asbestos is present and how the hazard is to be remedied. All asbestos remediation and disposal shall be performed in accordance with Federal, State, and City guidelines and policy.**

To mitigate adverse effects where a significant number of unreinforced buildings are concentrated in the Downtown Corridor (within the boundary shown on **Figure 9-1**), the following mitigation measures should be required:

Issue 2: Noise Inconvenience

(2) **To minimize noise effects, all stationary construction noise sources shall be sheltered or enclosed to minimize effects. When feasible, generators and pneumatic compressors shall be placed in parking areas or behind buildings outside of public and business pedestrian traffic corridors. Flexible work hours (including evening and weekend construction) shall be permitted only if nearby residential areas can be protected from noise sources. All construction shall comply with the City's Noise Ordinance.**

Issue 3: Dumpsters, Dust, Odors and Other Minor Inconveniences

(3) **All contractors involved in building strengthening shall provide a written dust suppression strategy to be submitted with building permit applications. Dumpsters, pre-assembly construction tasks, and materials storage shall be limited to defined, proscribed areas. Their materials storage and work areas shall be situated, to the degree feasible, behind rather than in front of buildings where upgrades are being done, or in parking lots adjacent to construction locations. Construction schedules shall be made available to adjacent building tenants. Dust covers and temporary building sheathing as well as other dust suppression methods shall be used when appropriate. Construction activities shall be coordinated with tenants and, to the degree physically feasible, the concerns of tenants shall be respected in all seismic upgrade construction planning.**

Issue 4: The Duration and Organization of Construction

(4) If a Level III program is adopted, to minimize construction effects on the public, owners, tenants, and essential fire and police services providers, the City shall be partitioned into upgrade districts. Construction within the Downtown corridor shall, to the extent feasible (unless a building owner decides to pursue a strengthening program prior to scheduled completion dates specified in the ordinance), occur only during the specified time frame in the ordinance. These districts should be one block long in size and construction should be sequenced taking into account the economic viability of businesses within each block. A district program would probably not be warranted if a Level I or II program is adopted.

Issue 5: Construction Effects on Business Tenants

(5) To minimize construction effects on tenants, the City should appoint an upgrading liaison representative who would be responsible for implementing and monitoring compliance with a program to minimize construction effects on tenants. This program should be responsive to building tenants needs. Tenant participation in defining the scope of this program should be encouraged. Recommended components of the program include:

- if feasible or implementable, providing a system of fines or penalties for the contractors if the construction goes on longer than planned; this system of penalties would not involve the City directly but could take the form of a liquidated damages clause between owners and contractors;

- the City should provide a construction liaison to coordinate complaints and to advise owners, tenants, contractors about the need for consultation in construction scheduling between the tenant, the building owner, and the contractor;

- a streamlined process for approving plan modifications should be established to minimize disruptions in buildings where plan changes are necessary;

- prior to initiation of construction, a schedule of activities should be drawn up and the tenant and contractor should coordinate regularly regarding planned activities;

- when physically and economically feasible, dumpsters should only be permitted out of the flow of business and pedestrian traffic (either to the rear or on the side of building not exposed to pedestrian movements);

- a pre-construction conference should be held between the contractor, the tenant, and the workers actually performing the upgrading; and

- all construction barriers should be planned to keep the building entrance and signage visible.

Mitigation Scope and Residual Effects

The mitigation measures outlined above are designed to lessen the impact of construction on building tenants, the public, and individuals patronizing businesses in the Main Street corridor. Throughout the rest of the City, construction related impacts are anticipated to be of no project specific or cumulative significance. The implementation of the proposed measures would fully offset any potentially significant effects associated with upgrade construction.

Adverse effects on tenants with the adoption of a Level III ordinance would be significant regardless of the location of a building in the City.

CHAPTER 11

COSTS AND BENEFITS:
POLICY IMPLICATIONS OF IMPLEMENTING AN ORDINANCE

Revisions to the Final EIR in Response to Comments on the Draft

A number of individuals commented that additional economic data should be collected about the ability of building owners to fund the mandatory upgrades being contemplated by the City. The affordability of the project and the relative costs and benefits of each strengthening option were reanalyzed in response to these comments. An economic questionnaire was circulated to all building owners to obtain data about the economic status of each owner. Nearly half of the unreinforced building owners in the City responded to this questionnaire. A new section has been added to this chapter reporting on the results of the analysis of this economic information. Unless otherwise noted, all dollar estimates provided in thic chapter are in 1990 values.

11.1 Introduction

The purpose of this part of the document is to provide the decision makers and building owners with sufficient information about the costs and economic consequences of adopting various ordinance options that an appropriate, fair, and economically viable strengthening program can be conceived. The adverse economic consequences of not adopting some form of strengthening program are also described. **This discussion is advisory only and concerns policy matters that decision-makers in other jurisdictions have found useful in deliberating over how best to achieve compliance with the State Unreinforced Masonry Law. Nearly all of the issues discussed in this chapter are, strictly speaking, not in the domain of CEQA concerns.**

The first part of this chapter reviews the constituents that need to be considered in evaluating the costs and benefits of an upgrade program. This section is followed by an evaluation of the costs of implementing some of the alternative ordinance proposals that have been considered by the City. Strengthening programs not considered by the City in the past as a possible ordinance option (e.g. a **Level III** standard provided in the State Model Ordinance) as well as other options (enhanced **Level I** strengthening or adoption of an ordinance similar to the San Francisco Section 104(f) provisions in the City Building Code) are also presented for comparison. The various costs associated with administering the ordinance both for the City and for property owners are also reviewed.

Fiscal impacts on tenants in buildings that must be upgraded are also discussed in this chapter and the experiences of business owners and tenants in the Cities of San Francisco, Ventura, Ojai and Santa Barbara are reviewed to provide some perspective on questions related to continued occupancy during the upgrade process and construction problems that interfere with business activities. Cost premiums that the continued occupancy during upgrading generate are provided for each class of building included in the Ventura inventory.

The next sections of this chapter review the costs of upgrading compared to the benefits of several strengthening options. Two major earthquake upgrading cost-benefit studies are reviewed to provide some comparative perspective on how other jurisdictions have addressed the cost-benefit equation. Academic literature on this topic is also reviewed briefly since the cost-benefit issue is a matter of consequence from a policy standpoint. The total upgrade costs for various strengthening levels are estimated.

11.2 The Cost to Benefit Decision Problem

Selecting an appropriate upgrading standard for increasing the seismic resistance of the existing buildings in Ventura is a difficult problem for the following reasons:

1. **There is significant uncertainty about the relationship between building standards and resulting deaths and injuries since this depends on the location and intensity of earthquake, the extent of damage to the property, and the number of occupants at the time of damage.**

2. **Adoption of an upgrade program involves a value judgment to determine an acceptable trade-off between the cost of upgrading and the desired reduction in deaths, injuries, and building damage.**

3. **There are several different constituents with varied and divergent interests in a potential upgrading program. For example, the owners of the buildings, the renters, the planners, the policy makers, and the public-at-large all may have rather different interests and concerns regarding the definition of an upgrade standard. Each of these constituencies would be impacted differently by an upgrading program and each of these parties of interest may have divergent viewpoints. Who should the decision-makers listen to most carefully in making their decision?**

When making a potentially unpopular decision which has substantial financial consequences, the impacts of any decision will be perceived differently by various constituents. Further, the selection of an upgrade alternative depends on the actions of the constituents in reaction to the chosen alternative. It is therefore important that the impacts of an ordinance on different constituents be considered explicitly in the evaluation of alternatives.

A decision by the City to adopt a mandatory rehabilitation ordinance will have an impact upon several constituents. The directly affected constituents are the renters and the building owners. **Owners of the buildings will have to pay the cost of upgrading or share it with the City if some financial incentives are offered. Building owners would, however, receive benefits in reduced property damage if an earthquake occurs, a clear appreciation in the value of their property, reduced liability in case a renter gets injured or killed in a quake, and probably higher future income from rents.** An owner should prefer the upgrading if the benefits are higher than the cost. **Building owners are often quite resistant to upgrading programs, at least in part, because many cities have not taken the time to accurately depict the effects of such a project on the owners and because little effort has been spent coordinating or participating in financing the upgrade.** The cost to benefit problem is, at least in part, a problem of communicating clearly the advantages of upgrading and committing to assist in the process. The **perception** of an advantageous cost to benefit ratio is important in achieving a suitable upgrade standard.

The renters of unreinforced buildings are another affected constituency with an interest in cost/benefit problems. Strengthening a building clearly makes the building safer to live or work in, but rents might also increase (unless or even if City subsidies are provided), and some renters may have to leave the building temporarily during the construction phase. Although not quantified for Ventura, it is common knowledge based on comparative data from other cities, some retail tenants in older, unreinforced buildings operate businesses which are only marginally profitable. These constituencies can usually least afford to pay substantially higher rents. It is therefore unclear, without an explicit examination of the costs and benefits of upgrading, whether mandatory building reinforcement is attractive from the renters' viewpoint.

Policy makers and planners constitute the third group who are affected by an ordinance, though indirectly, by the City's action. If the City requires costly upgrading, the sentiments of the owners will conflict with the administration making a cooperative funding program difficult to implement. Finally, the public-at-large is also an affected constituent. The group that suffers the most damage in case of an earthquake is often unidentifiable (the passing pedestrian, the individual purchasing coffee in a store, etc). Benevolent considerations also may become especially important in the process of developing an ordinance if the public perceives that the residents or occupants of the hazardous buildings are unfairly treated because of their age, income, or other social conditions.

Adopting a strengthening ordinance also is often difficult because the objectives of the decision are not clearly specified. Often, there are multiple conflicting objectives--life loss minimization, building damage reduction, minimizing impacts on building owners, economic redevelopment, altering the building stock, or preventing serious economic disruption after an earthquake. Sometimes objectives conflict: for example,

one objective in the earthquake safety problem is to reduce deaths and injuries, while another is to reduce the cost of rehabilitating unsafe buildings. These objectives cannot necessarily be met simultaneously, particularly if the City adopts an approach of non-involvement. The welfare of the landlords may be in conflict with the welfare of the tenants, and so on.

The preferences of the affected constituents should be taken into account in determining the trade-offs between the various conflicting objectives. In the earthquake safety problem, the dominant trade-off is between building upgrade costs and improved safety (measured in terms of reduced injuries and deaths).

Usually, in a cost to benefit analysis, the objective of evaluation is to compare the costs and benefits of the alternative policies and select the policy that is most preferred with respect to the preferences of the affected constituents. But which constituents? Unfortunately the preferred policy may be different for different constituents. Therefore, the most logical step in a cost\benefit evaluation would be to compare total costs with total benefits regardless of to whom the benefits accrue. This analysis ignores the distributional aspects of costs and benefits (that is, some groups may experience a relatively larger share of costs or benefits). This is the basic objective of this chapter. The second essential step in the evaluation of cost and benefits is for the decision-makers to compare the costs and benefits from the viewpoint of various affected constituents--tenants, owners, planners, the public and policy makers. The public hearing process on this document and a draft ordinance will provide this input. Based on these evaluations, an acceptable policy will need to be formulated.

A critical issue in formulating a policy is to ensure that it can be implemented and the enforcement is possible within the means of the concerned agency (City or State government). A crucial weak point in seismic safety policy is the enforcement of seismic design regulations. An explicit consideration of all possible obstacles that could impede the implementation of a policy must be well thought out in advance of policy adoption. A full hearing of the diverse and differing opinions and an explicit awareness of the potential problems before a policy is finally adopted are requisite for an ultimately successful policy. The EIR process has, to the degree feasible, met this objective. Of course, all discontent cannot be eliminated and all affected parties cannot be fully satisfied. An understanding of their concerns, though, would improve the design of a policy. A basic concern of property owners is whether the costs of a strengthening program have reasonable parity with the program's benefits. An effective policy is not one that attempts to incorporate every single concern, but a good policy recognizes what can and must be changed compared to existing conditions.

Prior chapters of the EIR, particularly Chapters 7 and 8, clearly illustrate the probable and assured benefits of adopting a strengthening ordinance. These public, social and economic benefits have been documented and are not reiterated in this Chapter. This part of the EIR addresses, in as realistic a manner as possible, the probable direct and indirect costs of an adopted strengthening program. In the concluding portion of the EIR, the Alternative Ordinance approaches (Chapter 12), recommendations are made to encourage a coordinated funding program for mandatory upgrades. Finalizing the form and degree of City participation will ultimately largely influence the outcome of the cost to benefit equation as perceived by various constituents.

11.3 Prior City Cost Evaluations: Estimates for Implementing Level I and II Strengthening Programs

The City has conducted a rather complete assessment of the costs of implementing the **Level I and II** strengthening programs. In 1988, the City contracted with a structural engineering firm with considerable experience in designing upgrade programs (Howard Stup and Associates) to generate predictions about the probable construction costs for upgrading buildings in the City to **Level I and II** standards. A sample set of nine unreinforced buildings was identified as the sample inventory that would be used to predict both specific and average upgrade costs for each level of strengthening.

The study included a total of over 77,000 square feet of building area situated at ten different locations within the City. Buildings included in the sample inventory were located at:

o	265	E. Main Street
o	391	E. Main Street
o	440-442	E. Main Street
o	467	E. Main Street
o	1780-1788	E. Main Street
o	305	S. Kalorama Drive
o	29	North Olive Street
o	2110-2126	E. Thompson Boulevard
o	2170-2174	E. Thompson Boulevard

Each building was evaluated in the field to determine what engineering improvements were required to achieve the proposed **Level I and Level II** structural upgrades. Once the engineering programs for each building were outlined, the opinions of probable construction costs were prepared by Hartigan/Foley Construction of Ventura. This firm has completed seismic upgrades for unreinforced buildings at 143 South California Street (Bombay Bar & Grill) and 235 West Santa Clara Street (Patagonia/Great Pacific Iron Works).

The field investigations at each building were performed by visual observation and inspection. No destructive investigation or material testing procedures were employed. For each building, the following elements were identified and incorporated into the analysis:

- o wall configuration, openings and thickness,
- o parapet height and thickness,
- o wall cracks and eroded mortar conditions,
- o interior cross wall locations and construction,
- o floor and roof framing construction,
- o floor and roof diaphragm construction, and
- o wall-to-floor/roof construction.

In addition, such non structural items as ceiling finishes, storefront assemblies, merchandise displays, and tenant improvements were also identified when their location appeared to affect any potential rehabilitation work. A brief description and photograph of each of the structures evaluated was presented in the Stup report.

Basis of the Cost Analyses

For predicted Level I and Level II work on each structure, the technical specifications in the City's Proposed Earthquake Hazard Reduction Ordinance were utilized for estimating required design work on each building. In addition, the following cost altering criteria were also used in the estimations:

- o No existing floor-to-wall anchors were incorporated into the structural upgrading for either Level I or Level II upgrading. Use of existing anchors requires that their structural capacity be established by destructive tests, which were outside of the scope of work for this study.

- o The existing interior open space of the buildings was to be maintained to simulate an upgrading that would minimize tenant disruption. Therefore, all structural upgrading work was, in general, designed to be located within or near the existing walls, columns and non-bearing partitions. This criterion was applicable to Level II upgrading only.

Final designs were prepared for each building identifying both Level I and Level II work. These designs were submitted to the cost estimator for review.

Probable Construction Costs for Individual Buildings

Each proposed upgrading design was studied by the cost estimator and compared to existing conditions at individual building sites. Based on this analysis, suggested modifications to the proposed design were studied and, if found to be effective in producing a cost savings, these modifications were used to prepare the estimates. In order to minimize disruption to tenants, all work at roof levels was estimated by performing the work from the "top down."

Both **Level I and Level II** upgrades would require that existing roof membranes on eight out of the nine structures be removed and replaced. The roof replacement cost (including demolition) per square foot for each building was generated by including a 20-year guaranteed roofing system in the estimates.

The probable construction costs were prepared assuming (1) that local union labor rates would be paid and that (2) all work would be done during normal weekday business hours. The estimations included the following percentage mark-ups:

Contractor profit........................6%
Contractor overhead.................9%
Contingencies...........................10%

The opinions also include funds for the following items:

- o The removal and reinstallation of shelving and other fixed equipment which would require temporary removal to complete any upgrade work;
- o Temporary dust control barriers and daily clean-up work;
- o The reinstallation of all exposed finish materials, electrical and mechanical systems removed or temporarily displaced during the upgrading work;

Exclusions to the opinions include the following items:

- o Fees for permits and engineering;
- o Costs premiums related to working with occupants in place;
- o Fees for tests and inspection agency work.

The resulting predicted upgrade costs at each building for a Level I and II strengthening are provided in Table 11-1. These tables summarize the per square foot costs for each location and total square footage to be upgraded.

TABLE 11-1
Level I Upgrading Costs for Selected Buildings
(1988 Estimates)

Site Address	Area	Cost	Cost/s.f..
265 E. Main Street	10,800 s.f.	$61,521.	$5.70
391 E. Main Street	3,900 s.f.	$25,704.	$6.59
440-442 E. Main Street	1,920 s.f.	$21,009.	$10.94
467 E. Main Street	9,650 s.f.	$45,970.	$4.76
1780-1788 E. Main Street	7,500 s.f.	$44,845.	$5.97
305 S. Kalorama Drive	9,650 s.f.	$29,658.	$3.07
29 North Olive Street	6,300 s.f.	$32,634.	$5.18
2110-2126 E. Thompson Blvd.	21,850 s.f.	$88,663.	$4.06
2170-2174 E. Thompson Blvd.	5,000 s.f.	$18,095.	$3.62

Level II Upgrading Costs for Selected Buildings
(1988 Estimates)

Site Address	Area	Cost	Cost/s.f.
265 E. Main Street	10,800 s.f.	$89,131.	$8.25
391 E. Main Street	3,900 s.f.	$46,555.	$11.94
440-442 E. Main Street	1,920 s.f.	$25,161.	$13.10
467 E. Main Street	9,650 s.f.	$64,176.	$6.65
1780-1788 E. Main Street	7,500 s.f.	$56,823.	$7.58
305 S. Kalorama Drive	9,650 s.f.	$31,171.	$3.23
29 North Olive Street	6,300 s.f.	$34,335.	$5.45
2110-2126 E. Thompson Blvd.	21,850 s.f.	$115,667.	$5.29
2170-2174 E. Thompson Blvd.	5,000 s.f.	$40,932.	$8.19

Reviewing the information in these tables, several important consistencies and observations are evident:

- The cost per square foot for both levels of upgrade is higher for smaller buildings than for larger structures;

- The predicted costs for **Level I** upgrades range from about $3.00 to $11.00 per square foot and the **Level II** predictions range from about $3.30 to $13.00 per square foot. **The costs for both Levels overlap substantially and the range of costs are nearly identical;**

- **Considering the small average differential between the costs of implementing the Level I and II upgrades and given the additional earthquake protection provided by the Level II upgrade standards, the Level II option appears to provide considerably improved seismic resistance for a relatively low cost.**

This final conclusion needs to be understood in the context of averages. As careful inspection of these tables demonstrates, in some cases, **Level II** costs are nearly twice as expensive for some buildings than **Level I** predictions. However, in other cases, the differences are generally relatively minor. This discrepancy is explained by the great variability in engineering requirements for individual buildings, the influence of shape and height on design, and related factors. And, this conclusion also should be made with a clear understanding of the weak predictive power of the average as a descriptive statistic in the case of engineering cost estimates.

<u>Prior Level II and III Upgrades in Ventura: Cost Data</u>

Several comments on the Draft EIR requested that cost information about previously upgraded buildings be summarized in the Final EIR. In response to this request, the consultants assembled the cost summary provided in **Table 11-2.** The cost data included in this table was obtained from the City and represented an estimated cost based on building permit fee charges; actually construction costs typically differ from fee estimates. Based on the data in this summary, the following average costs per square foot were derived:

Level I	$4.75
Level II	$6.70
Level III	$2.75

While the Level I and II cost estimates are both very close to the average values predicted for these types of upgrades, the Level III estimates are presumed to be spurious due to underreporting of actual costs. The close fit between estimates and actual costs reinforces the accuracy of the cost predictions for Level I and II upgrades.

Other commentors on the EIR requested that the City provide information about the anticipated upgrade costs for the seismic strengthening and reconstruction of the **Peirano Block.** In response to this request, **Table 11-3** was compiled. The anticipated **Level II** costs conformed generally with the other estimates cited previously. Preservation costs and historic reconstruction work, as illustrated in this table, are estimated to be nearly $56.00 per square foot. This degree of reconstruction and restoration is more extensive than what is anticipated for the **Level III** strengthening of historic buildings discussed in Chapter 9 (Cultural and Visual Resources).

<u>The Use of Averages: Cautions and Conclusions</u>

One of the most difficult problems confronted by agencies considering the adoption of strengthening ordinances is related to the poor estimating power of the average as a measure of the costs of upgrading buildings. An average cost value describes the sum of all costs divided by the number of buildings upgraded and a median cost (a statistic related to the average) defines the point in a continuum of costs where one half of the buildings will be more expensive and one half less expensive to upgrade. Neither values represent probable actual costs for any specific building owner.

Table 11-2

PREVIOUSLY UPGRADED BUILDINGS IN THE CITY OF VENTURA

Address	Business	Upgrade Cost	Square Footage	Year Completed	Strengthening Level
143 S. California	Bombay Bar & Grill	$15,000	5,000 sq. ft.	1983	Level III
34 N. Palm	Livery	$21,000	8,100 sq. ft.	1982	Level III
466 E. Main	Frankys	$47,500	10,000 sq. ft..	1988	Level II
540 E. Main		$31,000	4,620 sq. ft.	1986	Level II
2871 E. Main	Video Supper Shop	$30,000	4,500 sq. ft.	1988	Level II
2 W. Main	The 1903 Building	$70,000	7,040 sq. ft.	1991	Level II
801 Poinsettia Pl.		$8,000	2,100 sq. ft.	1988	Level II

TABLE 11-3

PEIRANO MARKET PRESERVATION COSTS

Area	Level II (URM)	Preservation	Total
Market	$ 16,820.00	$ 86,335.00	$103,155.00
Studio	13,765.00	70,660.00	84,425.00
Storage	6,500.00	33,350.00	39,850.00
Delivery #1	-0-	33,350.00	33,350.00
Delivery #2	-0-	65,724.00	65,724.00
Total	**$37,085.00**	**$289,419.00**	**$326,504.00**
Cost/Square Foot	**$10.25**	**$55.72**	**$62.86**

Source: City of Ventura Redevelopment Agency

When using the mean (or average) to describe costs, it is important also to provide the range of variation around the mean (the standard deviation of the mean). If a standard deviation is high, it means that there is a wide range of upgrade costs and the average is a poor predictor of the costs associated with upgrading any specific building. The mean values related to cost estimating upgrading programs have high standard deviations--in other words, there is a great range of variation around the mean and many building owners will be paying more, and many less, than the mean. This circumstance results from (1) the wide array of engineering problems that need to be solved in any specific building, (2) the variable construction methods used in older buildings, and (3) the differences in building shape that contribute to the complexity of an engineering solution. **Therefore, average cost values should only be considered very general estimates and individual owners should not use these averages directly to estimate the cost of upgrading an individual building.** To increase the accuracy of estimates, for upgrades other than **Level I and II,** the consultants have partitioned the estimates by classes of building identified in the Seismic Risk Model.

A second factor influencing costs is an economic concept termed "economy of scale." In very simplified language, this concept, as applied to unreinforced building upgrades, would state that with increasing building size, the per square foot cost of upgrading would be reduced, absent some unique engineering problems. Economy of scale effects were clearly identified in the Howard Stup inventory assessment summarized below.

With these stipulations in mind, summarizing the data quantified below, the average opinions of probable construction costs for each level of upgrading were defined to be:

Level I..$4.80 per square foot
Level II..$6.58 per square foot.

Cost premiums for construction with occupants in place, the extent to which the City reduces building permit fees, an owners interest in performing remodelling, and premiums for historic restoration have not been included in these averages.

11.4 Other Cost Estimates: Predictions for Level III and IV Upgrades and Other Strengthening Options

The data generated for the prediction of the Ventura **Level I and II** upgrades produced the interesting result of relatively minor differences, on the average, for the two levels of strengthening. Given these small average differences and recognizing that **Level II** standards would only apply to a sample of buildings in the Ventura inventory, the consultant concluded that the cost-benefits associated with adopting a **Level I** program versus **Level II** upgrades would not warrant adoption of the weaker standard, especially taking into account the results of the Seismic Risk Model results presented in Chapter 7.

Turning to the question of what the adoption of other upgrade standards may cost, one improvement was made in the evaluation process. The consultant integrated the building types outlined in the Seismic Risk Model with construction cost projections derived for these building types computed by Rutherford and Chekene for comparable structures in San Francisco. (Ventura building classes 1 through 5 were defined based on building shapes and other attributes--see Chapter 7 for a summary of attributes and for additional information and illustrations of these building types.) The terra cotta tile structures which comprised building prototype 6 in the Risk Model were deleted from the cost analysis for practical reasons related to accurate cost estimating. Therefore, the upgrade costs for several other options were related to the type of building needing strengthening. With this refinement, the estimates would be more accurate, the averages would be "weighted" by building type, and a range of costs comparable to the range of estimates provided in the Stup report would be made available.

Of the other ordinance options outlined in Chapter 5, three additional alternatives were selected for cost estimation. The options selected were: (1) out-of-plane strengthening, an option similar to the **Level I** case with several different and/or additional features to the Ventura Level I; (2) UCBC Appendix Chapter 1, an option that is more extensive than the Ventura **Level II**, and, for cost purposes is considered a **Level III**

comparable upgrade (State Model Ordinance) upgrade; (3) the San Francisco Building Code 104(f) which is also similar to the 1973 UBC standards; and **Level IV**, strengthening to current code standards. These options were selected because they represent the full range of reasonable options which could be considered for adoption by the City (in addition to **Level I**) and because very accurate, detailed estimation procedures were used on a sample of buildings in San Francisco to derive the average costs for upgrades on each building class similar to building types in Ventura. Cost estimate information for each relevant building class type comparable to San Francisco building classes are provided in the EIR Technical Appendix and in Rutherford and Chekene's study of the reinforcement problem for San Francisco.

The cost estimates for each upgrade Level are provided in **Table 11-4**. The cost estimates include both predictions of seismic retrofits and engineer/architect design expenses.

TABLE 11-4
Strengthening Project Costs for Three Ordinance Options
(Developed by Rutherford and Chekene)

Ventura Building Class	San Francisco Proto-type	Option 1: Expanded Level I		Option 2 Level III Model Ordinance		Option 3 S.F. Section 104(f)	
		Seismic ($/SF)	Arch. ($/SF)	Seismic ($/SF)	Arch. ($/SF)	Seismic ($/SF)	Arch. ($/SF)
1	A	9.17	0.67	9.96	0.75	13.26	0.89
2	K	9.97	1.83	10.95	2.00	15.55	3.00
3	B	5.32	0.27	7.50	0.37	8.83	0.47
4	G	11.35	0.96	12.62	1.04	16.68	1.76
5	F	4.11	0.10	6.86	0.71	8.32	1.16

Summarizing the costs of these options, total per square foot upgrade costs (including engineering and architectural fees) are estimated to be:

Level I: **$8.66** per square foot
Level III: **$10.54** per square foot
SF Code: **$13.97** per square foot.

All three of these options exceed the predicted average costs for **Level I and II** strengthening estimated by Stup. The differences are explained by (1) the inclusion of engineering fees, (2) increased upgrading requirements for these options, the deletion of certain cost factors from the Stup estimates, and (3) variation in labor rates in northern and southern California. **Level IV** costs were not subjected to detailed cost estimating procedures by Rutherford and Chekene. However, based on available comparative data and prior experience, the predicted costs for **Level IV** strengthening are estimated to range between **$40.00 and $80.00** per square foot.

11.5 The Site-Specific Engineering Report Component of the Ordinance

Most versions of the proposed Ventura ordinance require a building owner (1) to obtain a structural analysis of the building's deficiencies and (2) to prepare a set of plans detailing how an upgrade will be implemented.

The tasks that would be performed to prepare such a report would include the following activities:

1. Field measure and prepare floor plans and sections of the building. Form an opinion on the general quality of the masonry based on field observations. Analyze and review results of shear tests of masonry by an independent laboratory.

2. Perform a seismic analysis of the building. Identify the various lateral resisting elements. Determine the stress in each element and its capacity. Compare the required strength with the actual capacity.

3. Prepare a report of findings. The report would compare the provided strength with the required strength. The report would also provide information on how the building could be strengthened and preliminary costs for strengthening.

A minimum engineering cost of $2,500 is anticipated to complete this work. This cost increases by the number of stories involved and the complexity of the building. An engineering evaluation for a three-story commercial building would be about $6,000.

The completeness and presentation of strengthening schemes and cost estimating can vary considerably. If full scale engineering drawings and building sections are presented and if more formal construction cost estimates are obtained from outside consultants, the costs provided above should be increased by as much as $5,000.

The costs of laboratory materials testing is additional and normally paid directly to the testing laboratory. Minimum code-required shear tests may cost as much as $4,000. However, all of these tests do not need to be done at the time of the study. Other field investigations may include evaluation of foundations, quality and condition of wood, and tests of concrete. A reasonable budget for investigative lab tests pertaining to these issues is $2,000 to $4,000.

Depending on specific requirements and building complexity, a range of costs for analysis, design, and testing of construction materials is anticipated to be between about $7,000 for smaller, less complicated buildings to $15,000 to $20,000 for complex, large buildings.

11.6 Factors Affecting the Prediction of Upgrade Costs

Several important considerations can substantially increase the costs of completing upgrades to any level of strengthening. Some of these considerations have already been discussed (see the Cultural and Visual Resource section, chapter 9) and others are introduced in this section. One of the most important "cost premiums" necessary to produce an accurate representation of upgrading costs concerns the presence or absence of building tenants during the construction process.

<u>Cost Increases With Occupants in Place During Construction</u>

The cost of upgrading a building increases if the building tenants intend to remain during construction. In some cases, depending on the required upgrade, tenants would have to relocate or close, at least for brief periods of time. These cost premiums for retrofitting result from construction inefficiencies that must be sustained to prevent business closure. **All of the following conditions contribute to the size of the cost premium:**

- **Inefficient structural schemes resulting from requirements to minimize business interference;**

- **Inefficient construction procedures resulting from minimizing interference;**

- **Protection of areas adjacent to construction (rather than merely closing and enclosing the work area);**

- **Completion of some of the noisiest and most disruptive construction activities at night, on weekends, or during off-hour work.**

- **Longer construction periods creating higher general condition costs.**

To help organize the cost variations, three building prototypes were identified by combining various classes of buildings based on several attributes. Cost premium prototype buildings were identified as:

Group	Attributes
Industrial	Low occupancy Few partitions and low interior finishing
Commercial	Cyclic occupancy Moderate partitions and interior finishing
Residential	Continuous occupancy Many partitions and high interior finishing

Cost premiums for upgrading buildings with continued occupancy relatively assured were derived by Rutherford and Chekene based on conversations with knowledgeable contractors (Chapman, Herrero, Yura, 1990). Relevant cost increases were estimated to be:

Industrial Group	Commercial Group	Residential Group
15-25%	30-40%	30-50%

Depending on the type of building class involved, for most buildings in Ventura, cost increases associated with the maintenance of business during construction would range from a low of 15 percent to a high value of 40 percent. Most buildings in Ventura (which are commercial), cost increases would range from 30 to 40 percent. Translating this increase into per square foot dollar values, the average costs of Level I, II, and III upgrades with tenants in place are estimated to range from:

- **Level I: $5.52 to $6.72 per square foot**

- **Level II: $7.57 to $9.21 per square foot**

- **Level III: $12.12 to $14.76 per square foot.**

Architectural Remodelling Occurring Concurrently With Upgrades

The need to perform seismic strengthening work on a building will, in many cases, provide an opportunity to also remodel the facility. Based on comparative data from Los Angeles and San Francisco, such remodelling programs are frequently undertaken. This remodelling will be seriously considered by building owners because the seismic work will require a contractor to be on site, occupants to be disrupted, and some finishes and building service systems to be affected. Not only is it logical to complete remodelling work

while upgrading, it also may be cost effective due to "double use" of contractor's general conditions (5%-10%) and the architectural portion of seismic strengthening costs ($1-$3 per sq. ft.).

The cost added to a strengthening project if complete building remodelling is done concurrently can vary substantially. Mitigation of code deficiencies other than seismic rehabilitation would probably be required if work is extended much beyond minimum. For example, fire and handicap access regulations would be enforced. Other variables include the general level of remodel (from carpet and paint to "gutting"), the condition of foundations, the quality of finishes, and the occupancy type.

The cost of remodelling can be correlated to the building prototypes described in the prior section. Remodelling industrial buildings would be primarily limited to building service systems unless the building was to be converted to another use. Upgrades of plumbing, mechanical and electrical systems, with minor finish work, are estimated to cost from $5 to $10 per square foot.

Remodelling of commercial buildings involves service systems, public spaces, and code deficiencies, or could be extended into tenant improvement type work in private spaces. Basic overall upgrading of commercial buildings not including tenant improvements could add $15 to $25 per square foot to a seismic retrofit project. Tenant improvements could add another $25 to $35 per square foot.

Residential or mixed use buildings could have the largest variation, depending on the extent of a remodel. If room layout is maintained, remodelling could vary from $10 to $25 per square foot. If extensive internal reconfiguration is to be done, additional costs could be as much as $50 per square foot or more.

11.7 The Significance of Retrofitting Costs for Building Owners: Comparative Data from the City of San Francisco

This section of the document evaluates the costs of the retrofitting alternatives from the perspective of building owners using a method developed by Recht, Hausrath and Associates, Urban Economists (1990), who were retained by the City of San Francisco to obtain information about the effects of that City's proposed ordinance. The following discussion has been summarized from this study.

"Owner-burden ratios" were calculated for the San Francisco study to identify how the retrofitting costs compare to building income assuming existing uses, rent levels, and economic assistance. These ratios provide a means for assessing impacts on building value and a measure of potential financial hardships for building owners. They also provide an indication of the potential responses of building owners to the retrofitting requirements.

Owner-Burden Ratios

For buildings within the City of San Francisco, owner-burden ratios were calculated on a building-by-building basis for all commercial/industrial and residential structures. These ratios were then used to consider the extent to which the costs of retrofitting would reduce net income from the building, income that otherwise would be available to repay outstanding loans (if any) and provide return on owners' equity. Existing building value (a function of the income that can be earned from the building) would be lowered to the extent that net income is reduced. In other words, the value of unreinforced structures (under base case conditions without the retrofitting requirement and without an earthquake) would be lowered because of the costs required for retrofitting.

The owner-burden ratios identify the percentage of net building income that would be required to cover the costs of the retrofitting alternatives. The general formula for the calculation is:

$$\text{Owner Burden Ratio} = \frac{\text{Annualized Cost of Retrofitting Assuming 12\% Interest Rate and 10-year Amortization Period}}{\text{Annual Net Income Assuming Current Uses and Rent Levels}}$$

The owner-burden ratio is designed to provide a relatively simple measure of economic hardship that can be calculated for all unreinforced structures. The costs of the retrofitting alternatives used in computing the ratios were based on several levels of contemplated upgrades. Net income was defined as gross building receipts from rents (accounting for vacancy) minus operating expenses, insurance, and real estate taxes. The calculations did not assume any economic assistance that could be available to assist and encourage owners to do the retrofitting (since it is the purpose of this analysis to determine impacts in the absence of economic assistance that could be considered as mitigation for hardships that are identified).

The owner-burden ratios assume current uses and rent levels. It was assumed that building owners would maximize income from their property. Except in the case of rent-controlled residential units, rents reflect what the market will bear for the particular use and location of the building. This means that the owner cannot expect to generate more rental income from the building solely as a result of completing the seismic retrofitting work. In other words, the retrofitting work alone would not result in a direct pass-through of costs to building tenants. Higher rental income would only result from a change in the use of the property or in the real estate sub-market it serves (through conversion, new construction, or upgrading). Higher income would also potentially result from situations in which the cumulative effect of the retrofitting requirement would be an overall reduction in supply of space available to a particular sub-market of demand such that rents for the remaining space of that type are bid up to a higher level.

Based on a careful analysis of the San Francisco data, the owner-burden ratios indicate lowered future income would result for building owners in Ventura, and thus lowered value (as represented by the capitalized income stream), under existing uses due to the retrofitting requirement. A reduction in value means that owners would lose some or all of their equity in the building, depending on the amount of equity and the cost of retrofitting. Owners' equity represents cash invested in the building as well as value gained through market appreciation over time. For buildings with existing debt, reductions in value could be larger than the amount of owners' equity such that the remaining value is less than the borrowed amount. In those situations, **some owners probably would not have the incentive to repay existing retrofitting. Such owners, who were required to do the retrofitting, would likely relinquish their interest in the building to the lender. They also are likely to delay the retrofitting as long as possible.** In the event of foreclosure, lenders also would absorb losses equal to the amount by which the outstanding loan and the costs of retrofitting exceeds the value of the building after retrofitting.

The owner burden of the retrofitting requirement would fall on existing owners of structures (and, possibly, on lenders with existing loans on these buildings). It is the existing owner who must pay the costs of retrofitting or sell at a discounted value prior to retrofitting. Over the long term, the cumulative effects of the retrofitting requirement could result in higher rents for space in particular real estate sub-markets such that owners eventually could recover some of the costs of retrofitting.

Potential Hardships for Owners

The owner-burden ratios are summarized for all commercial/industrial and residential buildings in **Table 11-5.** The important conclusions that can be derived from this table become clear through a comparison of changing ratios under various alternative strengthening programs.

Table 11-5
Summary of Owner-Burden Ratios for Seismic Retrofitting Alternatives, Assuming Existing Uses and Rent Levels and No Economic Assistance (Based on San Francisco Data)

	San Francisco Level I (Similar to Ventura Level I)			San Francisco Level II Ventura Level III			San Francisco Level III (Similar to Level IV)		
Owner-Burden Ratios	Number of UMBs	Percent of UMBs	Cumulative Percent	Number of UMBs	Percent of UMBs	Cumulative Percent	Number of UMB	Percent of UMBs	Cumulative Percent
0 - 10%	83	4%	4%	28	1%	1%	15	1%	1%
11 - 20%	712	37%	41%	125	6%	7%	32	2%	3%
21 - 30%	552	28%	69%	438	22%	29%	101	5%	8%
31 - 40%	340	18%	87%	733	38%	67%	339	17%	25%
41-50%	161	8%	95%	342	18%	85%	457	25%	49%
51 - 60%	69	4%	99%	150	8%	93%	416	21%	70%
61 - 70%	27	1%	99+%	64	3%	96%	197	10%	80%
71 - 80%				36	2%	98%	179	9%	89%
81 - 90%				30	2%	99+%	92	5%	94%
91 - 100%							45	2%	96%
> 100%							83	4%	100%
Total	1,956	100%		1,956	100%		1,956	100%	

Note: Owner-burden ratios identify the percentage of net building income that would be required to cover the costs of the retrofitting alternatives. Costs are total costs, annualized assuming 12% interest and 10-year amortizations. Net income is gross building receipts minus operating expenses, insurance, and real estate taxes. The owner-burden ratios assume current uses and rent levels except for increased rents allowed under the pass-through provisions for capital improvements for residential buildings subject to the Residential Rent Stabilization Ordinane. No economic assistance is assumed. The burdens could be over estimated where there are other options for the property and where effects of the requirements on the supply of space could result in higher rents.

Source: Recht Hausrath & Associates 1990

The results for any one alternative provide an overview of how the costs of retrofitting would compare to building incomes under existing uses. The burdens could be overestimated for owners who have other options for their property (new construction, conversion to a different use, or upgrading to a different sub-market) and where effects of the requirements on the supply of space could result in higher rents.

The distribution of buildings by owner-burden ratios indicates that retrofitting costs would be significant to many owners. Under a **Level I or II** upgrade, ratios for most buildings would be in the range of 11% to 40% and the mid-point (where half the buildings are above and half below) would fall in the range of 21% to 30%. These ratios indicate that a considerable amount of future building income would be devoted to servicing the debt on an upgrade. Given these ratios, the burden on most owners of buildings upgraded under a **Level I or II** program would be in the form of lost equity. There may also be some situations where building values would be reduced below the level of outstanding mortgage balances to an extent that some owners would relinquish their interest in the building to the lender and the lender would absorb a portion of the retrofitting cost.

The owner-burden ratios would be higher under **Level III** upgrading. Ratios for most buildings upgraded to this strengthening level would be in the range of 21% to 50% and the mid-point would fall in the 31% to 40% category. The burden on most owners **Level III** strengthening would also be in the form of lost equity and long term service of debt to pay for the upgrade. By inspection, losses would be larger with **Level III** strengthening than with the adoption of lower standards. There also would be more situations where owners with outstanding debt on their buildings relinquish interest in the building to lenders who would absorb some of the retrofitting cost.

Hardships for owners would be significantly greater under **Level IV** than under the other alternatives. The **Level IV** upgrade entails a much more comprehensive and expensive program than what is being contemplated by Ventura as a **Level III** standard. Under existing uses, the owner-burden ratios for most buildings would be in the range of 31% to 80%; a very substantial portion of building income would need to be allocated to pay for the upgrade. About half the buildings in the inventory would have ratios above 50%. As a result, equity owners would lose a substantial portion of their equity, if not all of it. Many of those buildings with existing outstanding debt would probably relinquish interest in the building to lenders who would absorb significant amounts of the cost. **The owner burden ratios suggest that the economic disruptions of a Level IV program would be so severe that such a program should not be seriously contemplated as an option. The Level III program would create hardships for some building owners.**

The significance of these hardships would depend on the individual circumstances of building owners. Owners include individuals, business entities, and non-profit groups. There are owners with large investments in unreinforced buildings and others with relatively small investments (including those owning a partial interest in a building). There are owners with many other investments besides an unreinforced building and owners to whom the structure represents all or a major share of their investments. The extent of current outstanding debt on the property also varies substantially. There are situations where a building is owned free and clear of debt as well as buildings with varying amounts of outstanding debt. For these latter structures, the share of net income devoted to debt service varies depending on when the building was purchased or refinanced, the amount financed, and the interest rate. Information is not available to identify the particular characteristics and circumstances of owners of buildings in Ventura but the preceding profile describes existing conditions (based on comparisons with other cities in the State).

Hardships are likely to be most significant to owners who depend on income from the unreinforced buildings for living expenses, and owners to whom the building represents all or a major share of their investments (including those who may be counting on equity from the building for retirement). The significance of hardships would be less to owners with diversified investments for whom the building represents a relatively small share of the total portfolio. Some of these owners may be able to use losses from their unreinforced building to offset passive income from other investments, thereby reducing overall tax liabilities. There are also situations where owners also are tenants of buildings. These owners would have to contend with both investment hardships as well as disruptions/costs to business operations. The extent and degree of potential hardships for building owners described above provides an indication of the

likelihood that owners would protest over the adoption of specific retrofitting requirements. It also provides an indication of the degree and ease of compliance that may be achieved depending on the projected costs of upgrading.

Using the estimated average costs of upgrading for different types of buildings and occupancies provided in **Table 11-5, a summary table was prepared which, in simple terms, converts upgrade cost estimates (using best available data) used in computing owner-burden ratios to an ordinal scale of hardships. Table 11-6** summarizes estimates of hardship anticipated for building owners under the three upgrade levels described in the Seismic Risk Model. As shown in this Table, owners facing "greater" and "greatest" hardships as well as lenders for those buildings would be the most likely constituency to object to the requirements, and, from a standpoint of their personal economics, with good reason.

It is important to stress that the information in this table was developed using economic data in San Francisco and the levels of upgrade are not in all three cases directly comparable to the Ventura strengthening proposals. Correlations between San Francisco and Ventura strengthening programs presented in this table should be qualified with the following caveats:

- San Francisco Level I is somewhat more intensive than the Ventura Level I but the two programs are roughly comparable;

- San Francisco Level II is directly comparable to the Ventura Level II;

- San Francisco Level III is more expensive and somewhat more intensive than Ventura's Level III but less expensive than Ventura's Level IV.

However, despite the lack of complete agreement, **the information contained in these summary tables and in the following discussion is relevant for Ventura and should be considered in the decision-making process. In addition, subsequent to publication of the Draft EIR, the consultants collected and analyzed financial information from Ventura building owners (presented below) which generally confirmed the results of the San Francisco study.**

Some conclusions about hardships for Ventura building owners can be derived from this data. As shown in **Table 11-6**, the number of owners potentially in severe hardship categories would increase substantially as the upgrade requirements increase (1% of owners if a **Ventura Level I or II** option is adopted, 7% of the owners if a **Ventura Level III** program is adopted, and more than 30% of owners if a **Ventura Level IV** option is selected). Many of those owners in the category of "greater hardship" would be expected to delay the retrofitting work as long as possible. **In addition to delays, many of those in the category of "greatest hardship" would probably find it infeasible to ever do the retrofitting work.** The number of building owners in this category for **Ventura Level I or II** upgrades would actually be very small. Those experiencing either "greater or greatest" hardship may opt for a course of action that ultimately would result in their building being demolished. **Assuming that these estimates are appropriate for Ventura, possibly as many as 7% of the building owners in the City would experience severe hardship in attempting to fund a Level III (State Model Ordinance) upgrade.**

A review of Table 11-6 clearly indicates significant differences in the potential for property owner compliance among the range of strengthening alternatives. Assuming that forfeiture of a building and demolition would be a common remedy for owners categorized as being in "greatest hardship," it is obvious a Level IV program would have very severe and disruptive effects on owners. The Level I loss outcomes appear to be about average for statewide conditions. A loss or demolition rate of 7% of the building inventory is a more acceptable outcome. In cities where ordinances have been adopted, a loss in building stock due to demolition of 7% is not an uncommon result of ordinance adoption. Based on this comparative data, it appears that adoption of the most stringent ordinance requirements would have an effect on a significant number of building owners in Ventura.

Table 11-6
Seismic Retrofitting Alternatives: Summary of Potential Hardships To Owners and Lenders
(Based on San Francisco Data)

Nature of Hardships	Percentage Distribution of Buildings by Alternative Strengthening Level Level I	 Level II (San Francisco Strengthening Levels)	 Level III
SOME HARDSHIP: Costs of retrofitting primarily represent loss of owners' equity (some or all equity depending on circumstances) with limited hardship on lenders.	87%	67%	25%
GREATER HARDSHIP: Costs of retrofitting represent loss of owners' equity, and, for buildings with large outstanding debt, lenders begin to absorb significant portions of cost.	12%	26%	45%
GREATEST HARDSHIP: Costs of retrofitting represent substantial losses for equity owners, and, for buildings with outstanding debt, lenders absorb significant amounts of cost.	1%	7%	30%

Note: This table summarizes the owner-burden ratios from the perspective of the potential hardships for existing owners and for lenders. Hardship in any specific case would depend on the particular characteristics of the owner(s) and of the investment in the building. For these generalized categorizations, "some hardship" includes situations with owner-burden ratios of 40% or less, "greater hardships" includes those with ratios of 41% to 60% and "greatest hardship" includes unreinforced buildings with ratios over 60%. Comparability of San Francisco and Ventura strengthening levels are shown in Table 11-4.

11.8 The Cost of Upgrading for Ventura Building Owners: Can Local Building Owners Afford to Fund Mandatory Upgrades?

Data Base: The Building Owner Questionnaire

In response to comments on the Draft EIR, the consultants conducted a data collection program to obtain detailed information about the economic status of every unreinforced building owner in the city. The data collection effort is documented in the EIR Technical Appendix. In response to this questionnaire (which was sent to all 138 building owners potentially subject to the ordinance), a total of 70 responses (52%) were received. Of this total, 11 (8%) were non-responsive, 16 (12%) were partially responsive, 8 (6%) were responsive but inconsistencies in the data made the information provided suspect, and 34 (25%) owners provided complete, apparently reliable responses to the data request. Some inconsistencies in these complete responses reduced to 29 (21%) the number of responses that could be used to project the effects of ordinance adoption.

The responses included in the data analysis set used for economic analysis have not been provided in the text of the EIR to assure respondent's confidentiality. As promised, identifying information that would enable public recognition of the specific building owners supplying financial data have not been included in the EIR. The confidentiality of the information obtained from building owners has been maintained and even City staff have not seen the original data responses or any summaries that would permit identification of building owners. While not a statistically obtained stratified or random sample, the consultants initially thought these responses had a high probability of accurately characterizing the economic condition of a representative sample of building owners.

Prior to analyzing the most reliable data obtained, a brief review of other building owner responses to the questionnaire is warranted. Of the respondents identified as Non-responsive, the following observations were provided by owners in lieu of completing the data request form:

- two owners expressed willingness to comply with any adopted standard;
- one owner expressed willingness to perform a **Level I** upgrade and presented a financial analysis of why the **Level III** program would be economically burdensome. This analysis was documented with tax return data;
- two owners indicated that funding a **Level III** upgrade would take between and 10 and 20 years of all net building income to offset costs;
- one building owner indicated that income from the rental of several unreinforced buildings was a major source of family income that would be lost if any expensive form of mandatory upgrade was required;
- three lawyers, either representing their own or their clients interests, declined to provide any financial data; and
- four owners resented the assumed conclusion of the questionnaire cover letter that failure to respond would be presumed to represent an ability to pay for upgrading.

The information on the 16 Partially Responsive and 8 Responsive but Inconsistent questionnaires was interesting because a consistent and directional pattern was observed which made the information valuable though not useful for computing owner-burden estimates for Ventura. A considerable number of these responses represented cases where the building owner was also the tenant and therefore rental income data was obviously not available. Respondents classified as being owner-tenants made the following observations:

- o most of these owner occupied buildings were either fully paid for or the owners had very substantial equity and low mortgage payments;

- o none of the presumed owner-occupied respondents had less than at least a 60% equity to debt ratio; and

- o approximately ten buildings in these two categories were fully paid for and many of the remainder had only very minimal remaining debt.

The information obtained from the remaining building owners was analyzed to estimate the fiscal effects of ordinance adoption on building owners.

Data Analysis

The problem of analyzing the information obtained from the questionnaire without compromising confidentiality limited what types of information could be publicly disclosed. Therefore, the data set for the analysis has been summarized. Financial data pertaining to a total of 29 building owners was tabulated. Variables for which data were obtained included purchase price and date, annual taxes, interest on debt, estimated annual income, number of tenants and income from each, current loan balance, current equity, and number of years a building were held. Responses were obtained for buildings ranging in size from 1,300 to 25, 000 square feet. An initial tabulation of the variables included in the data set derived from complete responses resulted in the following observations:

- o of the total sample respondents, nearly 50% owned their buildings free and clear and another 10% only had minor outstanding debt;

- o equity as a percent of purchase price ranged from a low of 10% to more than 100%;

- o buildings with a tax liability of less than $1500 were usually either owned without debt or debt was very minimal in relation to value;

- o rents per square foot ranged from about $0.50 to more than $1.50 per square foot--the average reported value was about 70 cents per square foot; and

- o Most owners providing complete responses had owned their buildings for at least 8 years.

This final observation raised serious concerns about the degree to which the sample was representative of the larger population of building owners and therefore a simple test was conceived to determine whether the data set was representative. Suspecting that these ownerships were not representative of the larger sample of building owners, the consultants obtained publicly available tax assessment and deed transfer information from the County Assessor. This data was entered into a computer and sorted by date of purchase; the resulting comparison of purchase dates in the data set and in the Assessor's information clearly indicated a very poor fit between the sample obtained from the questionnaires and the deed transfers recorded by the Assessor. **The unfortunate conclusion of this exercise was that the information obtained from building owners was skewed substantially towards owners with a long term interest in their buildings. This bias explained that unexpected result than nearly 50% of the reporting owners held their buildings without debt. If this represented City-wide conditions, the publicly argued financial problems ordinance opponents have anticipated with upgrading would not have been documented by the data. However, given the poor fit between the sample data and actual conditions, it was impossible to derive representative conclusions from the questionnaire data directly.**

With this unfortunate result, the remaining information in the economic questionnaire was analyzed to see if some alternative method could be devised to estimate the affordability of a strengthening program for all building owners in the City. By plotting the relationship between tax liability and date of purchase for the detailed data obtained from the property owner questionnaire, an indirect measure was generated of the extent to which an owner had equity in a building. The plotted data (displayed in **Figure 11-1**) were then cross-referenced the list of buildings without debt to derive an estimate of the number of buildings with sufficient equity to fund the upgrades without excessive burdens. Based on this method of estimation and using nearly the entire sample of buildings contained in the Assessor's records (contained in the EIR Technical Appendix), a summary table (**Table 11-7**) was prepared which displays the date of the most recent deed transfers for all the buildings in the inventory. Cross referencing this table with the confidential data obtained from building owners, a rough estimate of the affordability of a mandatory upgrade for building owners was obtained. **Based on this analysis, it appears about 40% of the inventory is currently owned either free and clear or with only minimal debt (equivalent to ownerships with tax liabilities under $1000). On the other hand, about 40% of the buildings in the downtown area have very low equity in relation to debt; for these ownerships, borrowing additional money to fund upgrades would be difficult (unless other assets were available to the owner) and, presumably in some cases, impossible. Another 20% of the building owners fall between these two extremes. Because of this wide divergence in individual owner economics, it would be very difficult (if not impossible) to derive an economically non-disruptive (or minimally disruptive program) which could equitably be applied to all ownerships.** The ranking of building owners on the ability to pay and requiring more successful owners to fund their upgrades (while exempting less wealthy owners) would be of questionable constitutionality. It is interesting to note that nearly 50% of the buildings in the inventory have been purchased in the past 7 years. Since 1988, a surprisingly large percentage of the buildings in the inventory have been purchased by new owners; these changes may reflect the loss of major tax benefits that resulted from the 1987 Tax Reform Act. **Despite the relative crudeness of this analysis, it is evident that adoption of a mandatory strengthening program with relatively high implementation costs may create considerable hardship for as many as 50% of the downtown building owners.**

This level of hardship was confirmed when the owner-burden computation methodology used in San Francisco was applied to the data set obtained from the questionnaires. **Table 11-8** summarizes the computation of owner-burden ratios for a selection of Ventura buildings. The ratios for the **Level I** upgrade confirm a generally high burden for owners whether a **Level I or II** upgrade is required. Owners not experiencing significant hardships would be confined to the group of buildings with minimal debt and reliable tenants. These findings are informative but should not be regarded as a statistically valid sample representing the full range of variability in the community.

<u>The Business Climate in Downtown Ventura: Local Economics and Reinforcement Costs</u>

Individuals commenting on the EIR frequently made references to reputed depressed economic conditions in the Downtown Community. These commentors suggested that currently the older portion of the City's downtown is uniquely and more intensely economically depressed than other portions of the City. In response to this concern, several estimates of general economic trends in the downtown were examined. One of the most direct measures of economic activity which is comparable throughout the City is tax receipt data. Based on information obtained from the City Redevelopment Agency, gross tax receipts between 1981 and 1990 obtained from businesses in the downtown area have consistently increased with the exception of a minor reversal in 1984. Between the end of 1987 and January of 1991, gross tax receipts in the downtown area increased by a total of 39% (or about 13% per year (City of Ventura, Memorandum to the City Finance Officer, Tax Increment projections, May, 1991). Other surveys of the current financial status of Ventura's population (for example, the City's Economic Development Annual Reports adopted by City Council) document a moderately strong economy and higher than average per capita income (compared to state-wide averages). However, some of the general economic strengths of the City are less evolved and less obvious in the Downtown Central Business District.

TABLE 11-7

SALES OF UNREINFORCED MASONRY BUILDINGS

IN THE CITY OF VENTURA: 1955 to 1991

5 Year Increments	Number of Buildings	Percent of Total	Cumulative Percent
1955-59	2	2%	2%
1960-64	3	2%	4%
1965-69	1	1%	5%
1970-74	10	8%	13%
1975-79	20	16%	30%
1980-84	25	20%	50%
1985-89	47	39%	89%
1990-91	14	11%	100%
TOTAL	**122**	**100%**	
Properties with estimated tax liability less than $1,000:	**47**	**39%**	
Properties with estimated tax liability greater than $3,500:	**24**	**20%**	

TABLE 11-8

OWNER - BURDEN RATIOS FOR A SELECTION OF VENTURA BUILDINGS[1]

Square Footage	Level I Debt Service (per month)	Level II Debt Service (per month)	Level I Annualized Cost	Level II Annualized Cost	Estimated Annual Net Income	Level I Owner-Burden Ratio (Cost – Income)	Level II Owner-Burden Ratio (Cost – Income)
7,500	$1,050	$1,575	$12,600	$18,900	$27,461	45%	69%
5,950	$833	$12,495	$9,996	$14,994	$1,000	100%	100%
25,000	$3,500	$5,250	$42,000	$63,000	$165,000	25%	38%
1,300	$182	$273	$2,184	$3,276	$7,500	29%	44%
23,000	$3,220	$4,830	$38,640	$57,960	$12,000	100%	100%
2,000	$280	$420	$3,360	$5,040	$3,600	93%	100%
9,500	$1,330	$1,995	$15,960	$23,940	$14,500	100%	100%
8,900	$1,246	$1,869	$14,952	$22,428	$19,235	77%	100%
4,500	$630	$945	$7,560	$11,340	$12,000	63%	94%
2,000	$280	$420	$3,360	$5,040	$97,400	3%	5%
12,000	$1,680	$2,520	$20,160	$30,240	$24,000	84%	100%
8,300	$1,162	$1,743	$13,944	$20,916	$17,000	82%	100%

[1] Based on an average debt service of $.14 per square foot for Level I and $.21 per square foot for Level II.

Of the area where most of the unreinforced building stock is concentrated, the City's Economic Development Study of the Ventura Avenue and Downtown Communities concluded (1983:20):

> "The Downtown Central Business District seems to be a testing ground for new businesses who experience frequent turnover. Moreover, there is a concentration of thrift stores, second hand shops and antique stores operated by individuals or non-profit organizations. Within a five block area of Downtown, there are 17 such establishments."

The existence of the City's unreinforced masonry building stock contributes strongly to the maintenance of these present business uses which the City's economic study suggests are not particularly desirable for a variety of reasons (ibid., pages 20-25). There are several ways in which unreinforced masonry buildings contribute directly to the economic problems of the Central Business District. The most significant of these factors include:

o The size and shape of these structures were originally conceived to provide centralized warehouse, manufacturing and retail functions in a single narrow, long building with a narrow street exposure for retail service. With changes in the way goods were manufactured and sold in the first three decades of the 20th century and given and the distinct modern separation between manufacturing objects, storing, and selling them, the optimal modern retail building shape is basically exactly the opposite shape of what is typical of an unreinforced building on a major downtown street. The optimal modern small scale retail structure is wider than it is deep, a structure where retail space is shallow in relation to its length to maximize product visibility-the strip commercial mall, for example, represents a complete reorientation of space compared to unreinforced buildings which, in an older commercial area such as downtown Ventura, have very narrow street exposures and very deep coverage on narrow lots. The arrangement of space in relation to pedestrian exposure in unreinforced buildings reflects historic economic patterns, not present patterns. The mere absence of openings for natural light in these types of buildings discourages most office and higher profile retail uses.

o To build a second story on an existing one story building or to otherwise modify an unreinforced building to provide mixed uses or either expanded or internally differentiated retail space requires very extensive retrofit work. Moreover, since such buildings were typically constructed to the adjacent lot lines, second story access is a serious problem which cannot easily be solved without usually reconstructing the entire front of a building. Given the narrow profile of these structures, alterations to provide exterior second story access is limited. Therefore, the shape and age of these buildings in many cases precludes obtaining better use of the property without very substantial investment in reinforcement and remodelling. Such investment is often simply not economic for a building owner.

o A relatively large percent of unreinforced buildings in Ventura are owned free and clear (or very nearly so) which also discourages investment, intensification of use, or other physical modifications which might encourage a change of use or the introduction of other types of building tenants. Even with relatively low rents (on the order of $ .60 per square foot), if a building is owned free and clear (as many are in Ventura), net income from an unreinforced building can be relatively competitive with net income derived from newer, more expensive, and more recent building investments. With low to non-existence debt service and little investment incentive for changing or altering the size and shape of unreinforced buildings, net building income, even in reportedly "depressed" conditions,

approaches typical incomes from much more recent construction (Jon Martin, Michael Towbes Construction, Personal Communication, August 1991). Under these circumstances, the incentive to invest in modifying a building or to find new types of tenants (other than relatively marginal businesses) is small.

In summary, the physical layout of unreinforced buildings--their narrow profiles in relation to length, poor structural qualities, absence of setbacks in relation to adjacent buildings, and other attributes--combine to minimize what physically can be done to create proper space for mixed residential-commercial uses, for diversified retail businesses, or for office uses. Making even minor alterations in present occupancies and uses could necessitate very substantial and expensive strengthening and therefore building owners tend to perpetuate present tenancies or seek tenants that would either be unable or unwilling to make major internal modifications to a building. Moreover, since a substantial portion of the building stock is owned free and clear, low rents still provide very competitive incomes for a portion of the owners. All of these conditions tend to depress the potential for economic growth and change in the Central Business District. The existence of a concentrated stock of unreinforced buildings in the Central Business District has, at least in part, had an economically depressing effect on the Downtown.

11.9 Replacement and Demolition Costs: The "Like for Like" Option and Restoration Costs After an Earthquake if Strengthening is Required

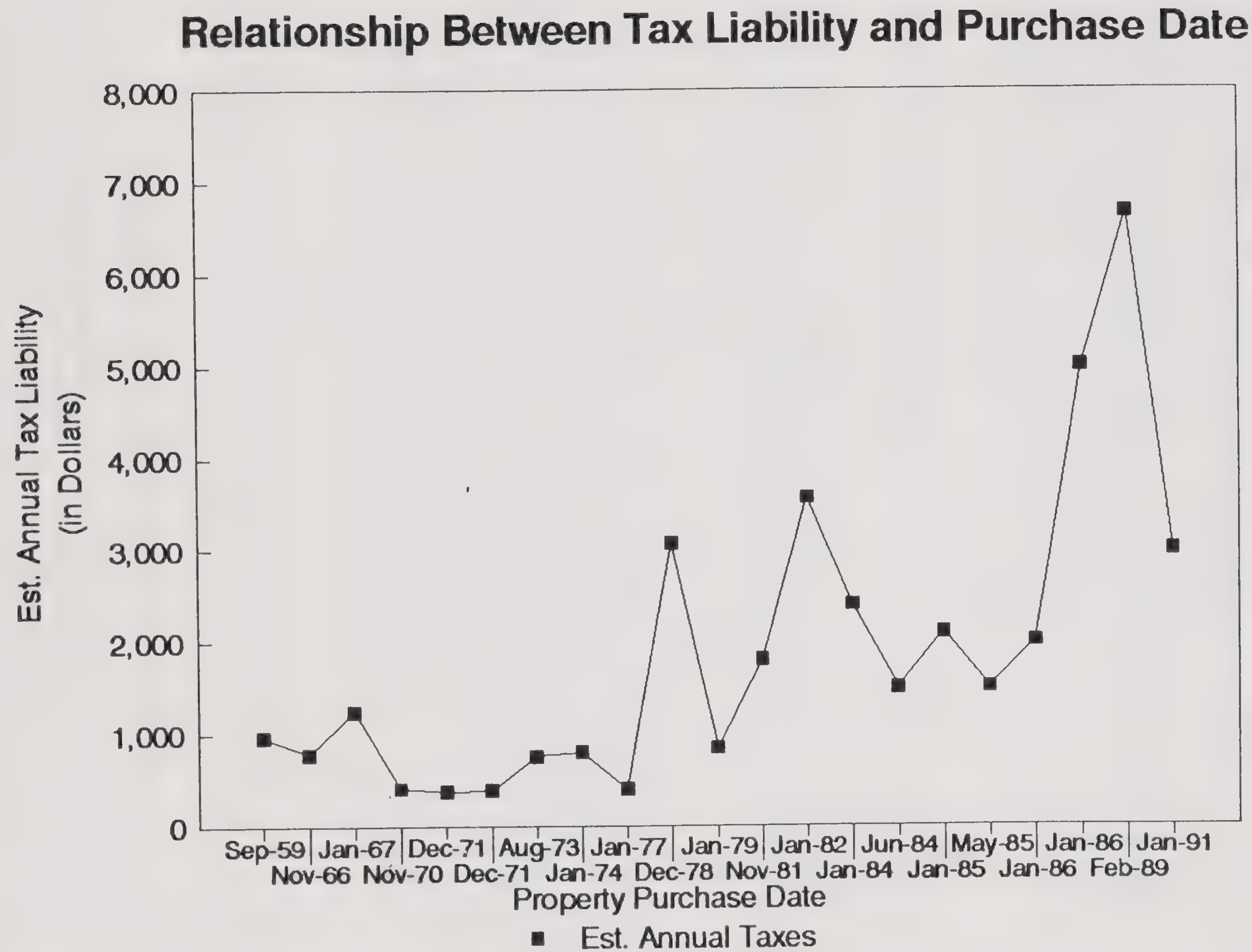
"Like for Like Replacement: The Economics of Encouraging Demolition

During public hearings on the proposed Ventura ordinance, building owners expressed concern about the relationship between upgrade costs (particularly for more intensive upgrades) and the costs of demolition and reconstruction. In addition, since the Ventura Ordinance proposals generally included a "like for like" replacement option, some estimates of demolition and replacement costs were determined to be needed to make informed judgements about the economics of a mandatory strengthening requirement.

Demolition may be a reasonable course of action since even after very intensive upgrades, buildings could be damaged significantly by an event on the Pitas Point-Ventura Fault. After establishing average "Like for Like" replacement costs, the issue of restoration costs after an earthquake is considered.

Table 11-9 provides cost estimates to replace a prototypical building included in the five classes of structures defined for Ventura. Each of these building class types are illustrated in Chapter 7 (pages 7-4 through 7-8); these classifications were also used in the Seismic Risk Model to summarize data about the City's building inventory. The data in this table are provided in dollars per square foot to assure comparability with prior tables summarizing upgrade costs. These predicted replacement costs assume that no land purchase costs would be encountered. Since unreinforced masonry structures are not allowed by current building codes, the replacement building has been assumed to be constructed of cast-in-place concrete or wood frame with concrete (stucco) veneer. Where applicable, tenant improvement costs, such as partitions, carpeting and painting, have been included. **Table 11-9** also gives the cost to demolish a building in dollars per cubic foot of building volume. Dollars per cubic foot is the standard estimating unit of measure for demolition activities.

Figure 11-1



Relationship Between Tax Liability and Purchase Date
Est. Annual Tax Liability (in Dollars)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Sep-59
Nov-66
Jan-67
Nov-70
Dec-71
Dec-71
Aug-73
Jan-74
Jan-77
Dec-78
Jan-79
Nov-81
Jan-82
Jan-84
Jun-84
Jan-85
May-85
Jan-86
Jan-86
Feb-89
Jan-91
Property Purchase Date
Est. Annual Taxes

TABLE 11-9
Replacement and Demolition Costs by Building Class

Ventura Building Class	San Francisco Prototype	Replacement Cost (Dollars/Square Foot)	Demolition Cost (Dollars/Cubic Foot)
1	A	$63/SF	$0.25/CF
2	K	64	.24
3	B	59	.25
4	G	87	.29
5	F	62	.25

Replacement Cost Assumptions

Replacement costs were defined as the cost of replacing a building that has been demolished due to damages sustained in an earthquake or due to a decision to remove a building as a result of the promulgation of an earthquake ordinance. It was further assumed that construction conditions were to be considered normal (non-emergency), and that land and demolition costs would be not be included in the estimations.

Square foot replacement costs were provided by Rutherford and Chekene for each of the five building classes identified in the Seismic Risk Model using *Means Construction Cost Data Book* (Means, 1989) for new construction for residential, commercial, industrial and institutional buildings. Because these costs were determined originally for specific building types in San Francisco, for each building class, a geographical area adjustment factor was made based on the most common unreinforced study areas for the prototype. These adjustments were small. In addition, the Means San Francisco cost adjustment index has been applied, as has a labor overburden factor of 35% for union influences and unusual urban working conditions. Since the Ventura **Level I** and **II** estimates were based on union labor assumptions, these assumptions were carried forward in these estimates. Finally, a construction contingency allowance of 10-15% was included to compensate for unknown conditions that might be encountered by the contractor. Means (1989) and Richardson (1989) cost data quotes were consulted.

The unit demolition cost per cubic foot of building volume was used to estimate this factor. This approach is normally acceptable for most light construction and low rise buildings. This approach also assumes that there is normal access and no hazardous materials are encountered. **The policy significance of the like for like replacement option is discussed in Chapter 12.**

Restoration Costs After an Earthquake if Mandatory Upgrades are Required

In response to questions raised by City staff and the public, the consultants expanded the discussion of the cost-benefit questions to include a discussion of what costs and disruptions might result from restoring a building to use assuming (1) a **Level I, II, or III** upgrades are performed on (2) subsequently an earthquake occurs on either the San Andreas or Pitas Point faults. These questions are designed to assist the decision makers and building owners assess the cost effectiveness of the various strengthening options proposed. To put this issue into perspective, it is necessary to return to the outputs of the Seismic Risk Model which predict the effectiveness of various strengthening programs.

The Seismic Risk Model computes the amount of damage that would occur to unreinforced buildings in the City with various levels of upgrade. **Table 11-10** summarizes the building damage percentage anticipated based on the three conditions discussed throughout the document: a movement on the Pitas Point or the San Andreas and probable consequences within 30 years. By inspection, the average building damage percentages obviously decrease with greater reinforcement. This data indicates that with **even with Level III strengthening, the average damage ratio to structures in the City would be about 20% for an event on the Pitas Point and 16% for cumulative annual risks over a 30 year time frames.**

Taking this analysis a step further, **Table 11-11** was prepared to estimate typical restoration costs for an average building assuming a **Level III** upgrade is required and an earthquake occurs on the Pitas Point fault. Post earthquake restoration costs are projected to be about $13.00 per square foot or nearly $65,000 per building (assuming a 5000 square foot structure). Thus, total **Level III** costs assuming a base cost of $14.00 per square foot (without occupancy during construction) **plus** restoration costs of $13.00 per square foot would result in a total cost of almost $25.00 per square foot for upgrade plus restoration.

11.10 Disruptions to Commercial and Residential Tenants: An Estimate based on the Seismic Risk Model

Several persons commenting on the Draft EIR requested additional analysis of potential hardships on owners, residents, and tenants. Previous discussions have addressed construction related problems for tenants. This supplementary information has been provided to enable the decision-makers to consider general measures of disruption and inconvenience when considering cost benefit questions.

The Seismic Risk Model includes calculations of occupant days lost (both temporary and permanent) predicted for various earthquake scenarios. **Tables 11-12** through **11-15** summarize these data. Each table presents a projection of the total number of residential and commercial tenants to be permanently displaced by various earthquakes assuming different strengthening standards are adopted. Without a strengthening requirement, the number of residential tenants who would permanently lose their present housing ranges from a low of 20 persons (for a San Andreas quake) to more than 230 persons (for a Pitas Point quake). Commercial tenant disruptions are more extensive. Without strengthening, permanent displacements (associated with building demolitions) would range from about 148 individuals persons (San Andreas quake) to more than 1,700 persons (Pitas Point event). The persons displaced include building owners, their tenants, business employees, and regular customers using these businesses. As displayed in these tables, the number of occupant days lost due to post earthquake retrofits are very substantial.

TABLE 11-10

AVERAGE EARTHQUAKE RELATED DAMAGE AND PROPERTY LOSS AFTER SEISMIC UPGRADES ARE COMPLETED[1]

	Level I	Level II	Level III
Possible Consequences Within 30 Years	30%	23%	16%
San Andreas Movement	8%	6%	4%
Pitas Point Movement	34%	28%	20%

1 Losses expressed as a City-wide building damage percentage. Individual building responses to an earthquake may differ appreciably from the City-wide average damage percentage. If the property loss percentages are less that 50%, based on comparative evidence, the damaged building would more likely be restored than demolished.

Source: Rutherford and Chekene, Seismic Risk Model, 1991.

TABLE 11-11

ESTIMATED BUILDING RESTORATION COSTS

ASSUMING A LEVEL III UPGRADE IS COMPLETED

AND THE MODELLED PITAS POINT

EARTHQUAKE OCCURS

Average Damage Value:	20%
Average Restoration Cost:	$13.00 per square foot
Average Building Size:	5,000 square feet
Average Per Building Cost to Restore a Damaged Structure:	$65,000

Breakdown of Costs by Damage Percentage:

Damage Percent	Number of Buildings	Average Restoration Cost Per Building	
		Per Square Foot	Per Building
0 to 5%	11	$1.63	$8,125
5 to 15%	46	$4.88	$24,375
15 to 30%	54	$9.75	$48,750
30 to 50%	24	$16.25	$81,250
Greater than 50%	3	Demolition Assumed	Demolition Assumed

Note: These estimates assume the size of the average building is about 5,000 square feet. The accuracy of these projections cannot be estimated statistically. The damage percentages were determined by fitting model results to a Normal Curve. Actual costs may vary from these estimates considerably.

TABLE 11-12

RESIDENTIAL TENANT DISRUPTIONS PREDICTED WITH A SAN ANDREAS EARTHQUAKE

	No Strengthening	Level I	Level II	Level III
Occupant Days Lost Due to Restoration After A Quake	4,203	2,565	1,959	1,359
Permanent Displacement Due to Demolition (Number of Persons)	20	1	0	0
Total Occupant Days Lost Due to the Quake[1]	11,503	2,930	1,959	1,359

[1] Assuming a one year relocation period for residential tenants in demolished buildings.

TABLE 11-13

RESIDENTIAL TENANT DISRUPTIONS PREDICTED WITH A PITAS POINT EARTHQUAKE

	No Strengthening	Level I	Level II	Level III
Occupant Days Lost Due to Restoration After A Quake	9,449	13,665	12,583	9,050
Permanent Displacement Due to Demolition (Number of Persons)	234	96	51	16
Total Occupant Days Lost Due to the Quake[1]	94,859	48,705	31,198	14,890

[1] Assuming a one year relocation period for residential tenants in demolished buildings.

TABLE 11-14

COMMERCIAL TENANT DISRUPTIONS PREDICTED

WITH A SAN ANDREAS EARTHQUAKE

	No Strengthening	Level I	Level II	Level III
Business Tenant Days Lost Due to Restoration After A Quake	27,813	16,010	10,883	7,548
Permanent Displacement Due to Demolition (Owners, Employees, Tenants and Customers)	148	8	2	1
Total Occupant Days Lost Due to the Quake[1]	81,833	18,930	11,553	7,913

[1] Assuming a one year relocation period for tenants in demolished buildings.

TABLE 11-15

COMMERCIAL TENANT DISRUPTIONS PREDICTED

WITH A PITAS POINT EARTHQUAKE

	No Strengthening	Level I	Level II	Level III
Business Tenant Days Lost Due to Restoration After A Quake	47,565	74,711	69,411	41,716
Permanent Displacement Due to Demolition (Owners, Employees, Tenants, Customers)	1,784	722	335	93
Total Occupant Days Lost Due to the Quake[1]	698,725	338,241	191,686	84,157

[1] Assuming a one year relocation period for tenants in demolished buildings.

11.11 Funding the Upgrades: What Commercial Loan Resources Are Available?

The creation of a mandatory upgrade program will almost certainly involve the participation of the City, particularly if a really effective strengthening standard is adopted. The rationale for this conclusion is presented in detail in Chapter 12. However, reviewing the costs of an effective upgrade program outlined in this chapter, the inevitable conclusion is that these costs will be difficult to recover in a reasonable manner given the relatively low rents in the Downtown Community. The necessity for some form of assistance for at least a portion of the building owners is driven by two factors: first, there is considerable uncertainty about whether commercial loans can be obtained to fund mandatory upgrades and second, the existence of party walls and other adjacency problems in over 50% of the inventory (particularly in the Downtown Community) requires a coordinated engineering solution. The unavailability of commercial loans for Seismic upgrading has been discussed previously and is expanded upon in Chapter 12. The City has also researched this problem.

During prior attempts to encourage adoption of an ordinance, the City evaluated (in 1988 and 1989) the fiscal impact of attempting to finance structural improvements for unreinforced masonry commercial buildings through conventional loan sources; the City also evaluated the impact of loan funds on rents in Downtown commercial buildings. The City investigated the lending criteria of five banks: American Commercial, Bank of America, Bank of A. Levy, First Interstate, and Ventura Co. National. The following summarizes the findings. The programs offered by four of the banks were very similar. In general, to receive funds to do these repairs, the property owners would have to apply for a commercial real estate loan. The loan to value (after rehabilitation) could not be more than 70%. The terms would probably require a 5-year repayment, but some flexibility was expressed that loans could be amortized over 20-30 years, allowing for smaller monthly payments with a large balloon payment. The loan rates would be variable based on prime rates plus about 3 percent. The loan set-up charge would be about 3 points; other fees (appraisal, title, recording, etc.) could cost an additional $1,000 on a $50,000 loan. Given an acceptable loan to value ratio, most of the banks contacted did not reject the loan proposal concept; loans would be secured by either a second or third trust deed. In evaluating whether to grant the loan, the bank would look at several factors including the financial strength of the property owner, the building's condition, location and leasing history, and the financial status of the building's current tenants. All of the banks stressed that these loans would be tailored to the individual borrower, so the terms and points could vary. Bank of America was the only bank that did not offer a commercial real estate loan. Their suggestion for financing the upgrading would be to establish a 10-year, home equity based loan that would extend a line of credit up to $500,000. The security for the loan would be the property owner's home. **In summary, as is usually the case with conventional loans, with an established credit history, reliable tenants, adequate income flow, low debt to value ratio, and sufficient personal credit, commercial funding would be considered. However, certainly some owners would fail to qualify for such commercial loams. With a mandatory upgrade requirement, if such loans cannot be obtained, where would funding be derived?**

Obviously, one source of loan repayment (assuming such loans are made available to owners) would be to pass the costs of the upgrades on to tenants in the form of rent increases. For a selection of buildings, **Level I and II** strengthening costs were computed and converted to commercial loan values. Then, the rent increase per square foot necessary to service a loan amortized over 20 years, but payable in five years at an interest rate of 12.5% (prime plus three points) was computed as well as the total monthly payment burden. **Table 11-16** displays the calculated rent increases for **Level I** strengthening and **Table 11-17** examines the costs for **Level II** upgrades. **Table 11-18** displays the costs and potential rent increases for a fully amortized loan. **Level III** upgrades would convert to approximately 10 to 30% increases over these values.

These tables assume that rental recovery would only be for debt service, not capital investment recovery. Margining properties with balloon payments is a common real estate practice which assumes that the value of the property will increase to the point where the owner would find it to his advantage to refinance all existing debts and "take" any equity from his property at the end of the five year term. Whether sufficient appreciation is presently occurring to offset the principal investment for properties in the Downtown Community is doubtful.

Comparing the monthly debt service for these properties to the approximate rental values per square foot, anticipated rent increases could be significant. For owners interested in recovering capital investment as well as debt service, rents could be increased (if feasible) substantially.

Since the original 1988-89 research conducted by the City, an RFP was developed by the City in 1990 soliciting banks interested in participating in a public/private partnership to finance loans to unreinforced building owners. Two banks, Bank of America and Ventura County National Bank responded to the RFP. City staff has been negotiating an agreement with Ventura County National Bank which has the following terms: (1) the loan to value ratios for trust deeds would be 70% for a 1st, 65% for a 2nd, and 60% for a third Trust Deed; (2) the loans would be provided at current market rates; (3) the bank would charge processing fees but would waive points (a fixed fee generally calculated at between 1 and 3% of the total loan); and (4) loans would be amortized for 15 years but would be due in 5 years. City funds would be used only for loans in subordinate positions (2nd or 3rd Trust Deeds); the City's loan and the Bank loan would be coordinated to create a loan at 8% interest. Payments to the City would be interest only and due in 5 years.

Given this review of costs and the potential impacts and uncertainties of funding the program through commercial transactions, it is evident that the City will need to involve itself in coordinating and arranging for project implementation. This issue is addressed in more detail in Chapter 12.

11.12 Potential Financial Impacts on Affordable Housing and Ethnic Groups

The possible effects of a seismic strengthening program on the availability of affordable housing have proved to be a major concern in those communities that have attempted to implement strengthening programs. Potential negative social and economic impacts on affordable housing of a strengthening program include the following: a reduction in the supply of affordable housing; temporary displacement of tenants while strengthening is under way, as well as permanent displacement of some households as a result of demolition or rent increases; an intensification of social problems related to homelessness; higher residential rents; and increased debt burden for property owners. The problem is exacerbated because housing types most likely to need strengthening in our older urban areas are also often those most likely to be housing the poor and elderly, including a large percentage of single-room occupancy hotels. These groups, and public agencies that must provide for them, represent major stakeholders in action relating to implementation of a strengthening program. **The degree to which this concern is a problem is minimized by the ordinance as presently written; many residential units are exempt and nearly all of the unreinforced Ventura building stock is devoted instead to commercial and industrial uses.**

The basic problem is that of setting realistic standards that are affordable and that usefully improve performance (i.e., can be shown to save lives), as against setting desirable engineering standards that present such an economic and social burden to the owner that the only recourse is to demolish the building. Demolition provides a guarantee of seismic safety (as far as that particular structure is concerned) but throws an additional burden on the City's affordable housing resources.

Most of the potential social impact--family disruption, hardship to the elderly, doubling up of families, even homelessness--is economic in origin. Rent increases are economic in origin but may result in social upset. Even if the direct costs of strengthening can be accommodated, social problems such as the stress of temporary relocation would remain. Even then, one could argue that the problem is economic in origin because the low cost housing tenant cannot afford the kind of temporary housing that would be acceptably non-disruptive.

It is possible to conceive of a technical response to this problem that takes the form of special ordinance requirements that are directed towards housing (or low-cost housing). Presumably such standards would be somewhat lower, to reduce the possibility of demolition or non-implementation. But it is important to note that, while a relaxed standard might respond to the immediate social or economic dilemma, and might avoid generating resistance, it would be likely to jeopardize both life safety and the low-cost housing stock in the event of a serious earthquake. Such an approach, while perhaps in the near term, really evades the issue.

Table 11-16

LOAN COSTS FOR UNREINFORCED MASONRY BUILDINGS[1]

LEVEL I UPGRADING

FIVE YEAR TERM/20 YEAR AMORTIZATION

Site Address	Loan Amount	Monthly[2] Service	Building Area	Monthly Fee Per Sq. Ft.	Balloon Payment	Estimated[3] Loan Fees
265 Main Street	$67,568	$767.67	10,800 S.F.	$.07	$62,284	$3,378
391 Main Street	28,010	318.23	3,900 S.F.	.08	25,820	1,400
1780-1788 Main Street	49,123	558.11	7,500 S.F.	.07	45,282	2,456
2110-2126 Thompson Bl.	100,403	1,140.72	21,850 S.F.	.05	92,551	5,020

1 Based on Commercial Real Estate Loan information received from American Commercial Bank, Bank of A. Levy, First Interstate, and Ventura County National Bank.

2 Terms: 12.5% variable 5-year loan (amortized over 20 years). Based on prime rate of 9.5%.

3 Loan Fees: A 3-point charge for the loan, plus an additional 2% of the loan amount as an estimate for additional fees (appraisals, title reports...)

Note: Loan values are based on 1988 dollar estimates and do not include architectural or engineering fees.

Table 11-17

LOAN COSTS FOR UNREINFORCED MASONRY BUILDINGS[1]

LEVEL II UPGRADING

FIVE YEAR TERM/20 YEAR AMORTIZATION

Site Address	Loan Amount	Monthly[2] Service	Building Area	Monthly Fee Per Sq. Ft.	Balloon Payment	Estimated[3] Loan Fees
265 Main Street	$101,752	$1,156.05	10,800 S.F.	$.11	$93,795	$5,088
391 Main Street	51,601	586.26	3,900 S.F.	.15	47,566	2,580
1780-1788 Main Street	65,939	749.16	7,500 S.F.	.10	60,783	3,297
2110-2126 Thompson Bl.	139,479	1,482.42	21,850 S.F.	.07	120,276	6,524

1 Based on Commercial Real Estate Loan information received from American Commercial Bank, Bank of A. Levy, First Interstate, and Ventura County National Bank.

2 Terms: 12.5% variable 5-year loan (amortized over 20 years). Based on prime rate of 9.5%.

3 Loan Fees: A 3-point charge for the loan, plus an additional 2% of the loan amount as an estimate for additional fees (appraisals, title reports...)

Note: Loan values are based on 1988 dollar estimates and do not include architectural or engineering fees.

Table 11-18

FULLY AMORTIZED LOAN*

		LEVEL I			LEVEL II		
Site Address	Building Area	Loan Payment	Monthly Debt Service	Debt Service Per Sq. Ft.	Loan Amount	Monthly Debt Service	Debt Service Per Sq. Ft.
265 Main Street	10,800 SF	$67,568	$1,520.10	$.14	$101,752	$2,289.21	$.21
391 Main Street	3,900 SF	28,010	630.17	.16	51,601	1,160.92	.30
1780-1788 Main Street	7,500 SF	49,123	1,105.17	.15	65,939	1,483.49	.20
2110-2126 Thompson Bl.	21,850 SF	100,403	2,258.86	.10	139,479	3.137.99	.14

* Five year term, interest rate 12.5%.

Prior to adoption of any mandatory strengthening ordinance, the City should identify which buildings in the inventory are occupied by low income residential tenants and, depending on the result of this survey, possibly modify ordinance requirements to assure the perpetuation of low income housing opportunities.

Potential negative social and economic impacts of a strengthening program that would affect the supply of affordable housing are mentioned above. Parallel impacts that affect the business community have already been discussed: temporary dislocation, job loss, rent increases, and enforced permanent displacement. Regarding businesses, the burden will tend to be disproportionately large on small and marginal businesses that own or rent older commercial and industrial buildings in a community. **These businesses are of great significance: they often provide essential services or are start-up businesses. New employees are often at the low end of the economic scale, and frequently are recent immigrants to the community.**

Thus a strengthening program is likely to disproportionately affect the most vulnerable members of the business population: landlords living off the proceeds of older buildings, and employees of marginal or start-up businesses. In addition, useful services may be displaced, affecting the economic balance and composition of the local business community.

11.13 Fiscal Implications of an Ordinance for City Revenues

Retrofitting requirements also could have implications for the City's fiscal condition and these impacts are described briefly in the following discussion. The effects of retrofitting requirements on building values and building outcomes could affect property tax revenues to the City; the following discussion describes the short and long term effects on property tax revenues that potentially could occur with adoption of a mandatory strengthening program. Upgrade costs associated with mitigating the adverse impacts of retrofitting requirements also would have fiscal implications if those costs were supported by public revenues. At this time, there are no specific proposals for the assistance of building owners but some aid, particularly to owner-tenants with relatively few financial resources, may be required in the future.

Short Term Property Tax Revenue Implications of Lower Building Values Due to Retrofitting Requirements

Once retrofitting requirements are adopted, presumably the market values of unreinforced buildings would be lowered to account for the costs of the required retrofitting work. Value loss will probably be related to but is not directly measured by the owner burden ratios discussed in a preceding section. Until retrofitting requirements are satisfied, the value of unreinforced buildings would remain lower than the market values they would have without retrofitting requirements. Lower market values could mean lower property tax revenues until the requirements were satisfied, compared to property tax revenues under existing conditions.

The extent to which property tax revenues would be lower would depend on how the lower market values compared to assessed values for buildings when reassessment to account for retrofitting requirements is considered. Since passage of Proposition 13, assessed values of properties are often lower than market values because reassessment occurs only when property is sold. Without a sale, assessed values of existing properties are permitted to increase no more than two percent per year, although market values may increase at a faster rate. To account for the effect of retrofitting requirements, building owners could request that their property be reassessed. However, assessed values would only be reduced if the lower market value to account for retrofitting was below existing assessed value. Owners would be responsible for requesting a reassessment because of retrofitting, so the extent of the potential fiscal effect would depend on their initiatives. Because of the rules governing increases in assessed values under Proposition 13, some owners would not have an incentive to seek reassessment if they had held their property for many years and thus enjoyed a low assessed value before accounting for retrofitting.

Sales prices for buildings sold prior to retrofitting would be discounted to reflect the cost of the required retrofitting work. The new assessed value upon sale would be lower as a result of the retrofitting requirements than it would be if the property was sold in the base case without such requirements. The resultant property tax revenues would be lower as well. There also could be some offsetting effects from

higher assessed values and property tax revenues from non-unreinforced properties sold for higher market values because of higher rents and/or occupancies to accommodate tenants relocated from unreinforced buildings undergoing retrofitting. This latter effect could occur during the enforcement period for retrofitting requirements.

Based on the above summary, it is probable that assessed values and resultant property tax revenues from some unreinforced buildings would be lower as a result of retrofitting requirements. However, the overall extent of effects on property tax revenues would be less than effects on market values for these structures. Among alternatives being considered by the City, **Level III** would have the most severe effects on property tax revenues because retrofitting costs would be the highest under that alternative. Similarly, a **Level I** upgrade would have the least effects and **Level II** disruptions fall between these alternatives.

Property Tax Revenue Implications of Retrofitting

Property tax revenues also could be affected as a result of the different building dispositions expected because of retrofitting requirements. These effects would occur once the retrofitting work was completed or once new construction, conversion, or demolition occurred as an alternative to retrofitting. The effects on property tax revenues would depend less on what is done with a building by an owner to achieve compliance with upgrade standards and more on the extent of associated remodelling and tenant improvements done coincident with the upgrade. **Although earthquake safety modifications in unreinforced buildings are exempt from property tax reassessment, non-seismic related improvements, the addition of new square footage, and changes in architectural components in an upgraded building are not exempt by exclusion** (Proposition 127 Legislative Summary, 1990).

In situations where retrofitting requirements would result in buildings being demolished for new construction or converted to other uses sooner than in the base case (without retrofitting requirements), the property would be reassessed sooner, and resultant property tax revenues would be higher than under existing conditions. Situations would also occur in which retrofitting requirements would result in outcomes that would not otherwise occur with existing conditions (such as the conversion of some mixed hotels with residential and tourist units to solely tourist hotels). In these cases, property tax revenues would be permanently higher than under existing conditions. New construction or a change in use triggers reassessment of a property to reflect a new building (in the case of new construction) or major extension of the economic life of the existing building that increases the income-earning potential of the property (in the case of changes in use). It is possible that extensive upgrading to attract higher-rent-paying tenants as a result of retrofitting also could trigger reassessment and could result in higher property tax revenues.

For circumstances where retrofitting requirements would result in the demolition of buildings at risk because retrofitting would not be feasible, property tax revenues would be lower than under existing conditions, at least for some time. The assessed values of the demolished buildings would be removed from the tax rolls. Assessed value would be added for paving for parking use or other minor improvements (assuming that new construction would not be viable for a while into the future) and the result would likely be lower assessed values for improvements compared to existing conditions (where the existing building would remain). The exception to this situation would occur with old, outmoded or dilapidated existing buildings that had retained only minimal assessed value, particularly if the site was used for parking after demolition. It is reasonable to assume that the assessed values of the land would not be affected.

For buildings that are upgraded according to City requirements (without a change in use or major upgrading to attract higher-rent-paying tenants), assessed values and property tax revenues, once the work is completed, should be the same as existing conditions. Assessed values would return to prior levels in situations where they were temporarily reduced to reflect lower building values because of retrofitting costs. **Assessed values must by law be held at the level of value assigned at the time compliance with an adopted strengthening ordinance is initiated. SB 521 (1985) prohibits reassessment for 15 years when structural upgrading is done to comply with a local seismic upgrade ordinance.** Without an ordinance in place, the reassessment limitation is not valid. The reassessment limitation does not apply to non-mandatory building

improvements that are done coincident with mandatory upgrades (e.g., new interiors, tenant improvements, remodel work, etc.).

Loss of Sales Tax Revenues

An upgrade ordinance would also have some consequences on sales tax revenues for the City. Based on available information (Baker, J., Sales Tax Information Memorandum to City Council, December 12, 1990), retail sales in the Downtown Central Business District have been estimated to range between 35 and 40 million dollars for 1990 (excluding the Mission Plaza Shopping Center which is in the Downtown Redevelopment Area). Based on data accumulated since 1987, the values of retail sales in the Central Business District are estimated to be at least $75.00 per square foot annually. Converting this annual per square foot estimate to business volume in unreinforced commercial buildings in the downtown core (about 186,000 square feet), about $13,950,000 of retail sales occur in unreinforced buildings which generates sales tax revenues to the City of $139,000 per year. **Closing or seriously disrupting downtown buildings for one month to perform a Level III type of upgrade would mean a net loss to the City of about $11,625 in revenues.**

If another form of ordinance is adopted which encourages demolition (and ultimately replacement) of the existing building stock, and assuming further that if a demolition type of ordinance is adopted (similar to the Long Beach case which resulted in 60% demolition to achieve compliance), then revenue losses to the city are estimated to be $167,400 over a two year period (60% of 186,000 square feet = 116,000 square feet divided by $75.00 per year x 2 years = $16,740,000 dollars = $167,000 in revenues).

Other Economic Impacts

In addition to the direct loss to the City in terms of reduced sales tax, there is a potential loss to the community from primary and induced economic benefits resulting from demolition of or damage to the unreinforced building stock in the City. Industry specific regional multipliers can be derived from the Regional Industrial Multiplier System (RIMS) model developed by the US Department of Commerce, Bureau of Economic Analysis. The model shows the overall induced effects of primary expenditures in any economic sector. The gross multiplier coefficient represents the ratio of total income generated to the initial change in expenditures.

For example, the gross multiplier (a standard factor which summarizes the relationship between expenditures for different types of economic activity) which corresponds to primary expenditures in the retail trade is 2.12. The initial or primary expenditures of $13,950,000 induce expenditures calculated at 1.12 times this amount. The total (primary plus induced) expenditure generated as a result of the Downtown's unreinforced masonry buildings is $13,950,000 in direct expenditures plus $15,615,630 in induced expenditures, creating **a total economic impact of $29,565,630 to the community annually if these buildings are demolished.**

Although it is possible to conclude that some of the economic loss due to the demolition of these buildings will be transferred to other businesses in the City, businesses which close as a result of earthquake damage may lose some of their customers permanently to other businesses outside the area and have difficulty recreating a customer base. From a community wide perspective, it is also fair to assume that a part of the economic impact generated by Downtown businesses may be lost as people change allegiances and begin to trade with businesses outside the City.

To calculate current induced payroll impacts, the State of California earnings to output ratio of 0.8265 can be used. This ratio indicates that for every dollar in primary sales demand earned, approximately $0.83 is added to the area's household wage level. Thus, the $13,950,000 in retail sales generated by the Downtown's unreinforced masonry buildings support a total payroll of about $11,529,675.

To calculate current induced employment impacts, the State of California employment to output ratio of 51.7 can be used. This ratio indicates that for every $1 million in primary retail sales, approximately 51.7 jobs are supportable in the area's economy for all industries. The current number of indirectly supported jobs within the region attributable to the primary sales of Downtown's unreinforced masonry buildings are 718 ($13.9 million x 51.7 jobs).

Long Term Revenue Implications of Effects of Retrofitting on the Supply of Space

For real estate sub-markets where higher rents would be expected over the longer term as a result of effects of retrofitting on the supply of space, market values for affected properties would be higher as well. This effect is likely to be experienced primarily in the Main Street corridor. As upgraded properties are sold over time, they would be reassessed at higher values than if they were sold at lower market values under existing conditions. As this occurs, property tax revenues would be higher as well.

CHAPTER 12

ALTERNATIVE ORDINANCE APPROACHES: SUMMARY AND RECOMMENDATIONS

Revisions in the Final EIR in Response to Comments on the Draft

Two circumstances resulted in the need to modify some of the findings contained in the Draft EIR alternatives analysis. With the passage of Assembly Bill 204 and establishment of a state sponsored **Level III** code standard for all buildings, the pursuit of a locally developed ordinance with varying requirements for buildings with different degrees of hazardousness became impractical. Since the **Level III** code standard becomes effective in July of 1993 and given the framework for compliance considered in the draft Ventura ordinance, few buildings would have been able to be upgraded under a locally adopted alternative standard.

The second impetus for a change in the alternatives analysis was derived from the outcome of the economic data collected between completion of the Draft and preparation of the Final EIR. This assessment indicated that while a percentage of the building owners could fund the upgrades without substantial hardship, many owners would potentially have considerable difficulty complying with a mandatory upgrade with per square foot costs approaching $14.00. In addition, further research on tenant disturbances with different levels of upgrade confirmed that a **Level III** upgrade is best performed without occupancy (to reduce costs). Substantial business interference was predicted for both **Level II** and **III** upgrades. Given the marginal nature of some of the downtown businesses, the duration of interference was judged to be a potentially significant problem. Finally, the economic review suggested that for building owners with substantial equity in their properties, building demolition and construction of new structures with greater potential for investment return was a potentially very viable option. Therefore, to encourage the economic development of the Downtown Community, the consultants made changes in the recommended ordinance to encourage the accelerated transition to new construction. With the adoption of an ordinance with substantial development incentives to encourage the demolition and replacement of unreinforced structures, new investment in the downtown would be encouraged. All of these considerations contributed to a re-analysis of the alternatives to the project as proposed.

12.1 Legal Requirements for an Alternatives Analysis

The California Environmental Quality Act requires that an EIR present reasonable and feasible alternatives to a proposed project, including the "no project" alternative. The purpose of the following discussion is to ascertain whether an "environmentally superior" alternative to the proposed project can be conceived. Section 15126(d) of CEQA Guidelines recommends that the discussion of alternatives should focus on revisions to a proposed project that can either <u>eliminate a significant effect</u> or <u>reduce the severity of an impact</u>.

An EIR must describe a range of reasonable alternatives to the proposed project, or to its location, that could feasibly attain the project's basic objectives. The document must include an evaluation of the comparative merits of each alternative (CEQA Guidelines, section 15126, subd. (d); section 21100, subd. (d).) The discussion must focus on alternatives capable of either eliminating any significant adverse environmental effects or reducing them to a level of insignificance, even if such alternatives would be costly or to some degree impede the project's objectives (Guidelines, section 15126, subd. (d)(3).)

If an alternative would result in one or more significant effect in addition to those that the project itself would cause, the adverse effects of alternatives must be discussed, but in less detail than is required for impacts caused by the project itself (Guidelines, section 15126, subd. (d)(4).) Recent court cases have clarified that the discussion of alternatives need not be exhaustive and the requirement to discuss alternatives is subject to the test of reasonableness. An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose <u>implementation is remote and speculative</u>. (Guidelines, section 15126, subd. (d)(5).)

One of the alternatives analyzed must be the no project alternative which must describe what condition or program preceded the project. If the no project alternative is environmentally superior to all others, the EIR must also identify which of the other alternatives causes the least environmental damage. (Guidelines, section 15126, subd. (d) (2).)

The degree of emphasis placed on the alternatives analysis is more elaborate than similar sections in other documents for three reasons: first, there are a wide range of alternatives to the ordinance proposed by the City; second, the actual physical environmental effects of adopting any alternative are relatively similar and impacts associated with each option differ more in degree and scope more than type; and, mitigating the adverse effects of either the project or any other alternative will, for some portions of the City, inevitably require the coordination and possible participation of City government.

12.2 Summary of Significant Impacts to be Mitigated

The EIR has presented in considerable detail the range of physical, economic, and possible social environmental effects that the ordinance is designed to prevent from occurring in the event of a moderate to strong earthquake.

The long and short term effects of a moderate to strong earthquake on the City of Ventura include but are not limited to the following substantial adverse effects:

- **loss of life;**
- **loss of retail and commercial buildings;**
- **destruction of personal property;**
- **damage to or loss of housing units;**
- **decline in or elimination of historic building stock;**
- **homelessness and lack of affordable housing;**
- **disruption to or elimination of income; and**
- **economic depression of the downtown core.**

The proposed project was conceived to minimize these adverse effects to the extent feasible within the realistic constraints generated by the physical and economic consequences that would be created if an ordinance were adopted. These predicted effects include:

- **construction effects (noise, dust nuisance, air quality effects, temporary parking, materials storage, and circulation problems);**
- **minimal disruption to the significance of the historic streetscape;**
- **reduction in building stock through gradual demolition of properties which owners decide not to upgrade;**
- **potential short term (and in some cases long term) economic hardship for some business owners, building owners, and low income renters.**

The degree of dislocation and potential hardship on building and business owners and tenants, the extent of modification to the historic fabric of the City, and the type and duration of physical impacts related to

construction are directly related to the upgrading requirements that are ultimately adopted. In many instances, as discussed in the preceding chapters, the degree of impact associated with different ordinance options is more apparent in the economic sphere. The physical effects of any form of upgrade are very similar. Therefore, the alternatives analysis focuses on the economic consequences of various options. **Mitigation measures have been conceived for both physical and economic effects.**

Before reviewing alternative ordinance options, a discussion of two important legal problems related to ordinance adoption are presented for consideration.

12.3 Economic Considerations in Selecting an Ordinance Alternative

Historically, opposition to unreinforced building ordinances have relied extensively on economic arguments. Therefore, it is essential that at least some information be presented about the market in unreinforced masonry buildings and how the sale and exchange of these buildings often differ from conventional real estate transactions. The following discussion is largely based on anecdotal evidence and academic studies including Alesch and Petak's 1986 study and consultations with real estate agents in Los Angeles and San Francisco.

There are a variety of reasons unreinforced building owners throughout California have objected to and challenged attempts to instate strengthening ordinances. These objections are presented in a compelling manner, usually with the assistance of attorneys and expert witnesses. **There is an economic basis prompting these challenges that is both rational and formidable.** Unreinforced building owners in California can be partitioned into several classes of ownership that reflect owner motives:

1) **buildings are held by families and small partnerships and have been owned by a single entity for at least several decades (or longer);**

2) **a considerable stock of unreinforced buildings are also held by larger corporations as part of long-term development strategies for downtown or other areas subject to redevelopment;**

3) **masonry buildings have also been purchased by owner-occupants with small businesses; and**

4) **unreinforced buildings also are held by individuals and corporations for the tax advantages that can be realized from the exchange of these structures in certain settings.**

Based on the consultant's review of the Ventura inventory, many ownerships are characterized by either the first or third of these classes. These building owners typically have very substantial equity in relation to debt and many buildings in these classes are held without debt. At the other extreme, a substantial number of the buildings in the inventory have been purchased relatively recently (since 1988) and the equity to debt ratio for these buildings is presumed to be low; obtaining sufficient capital to perform a **Level III** upgrade for buildings in this class would probably be difficult for many of these owners. Depending on the degree to which a building is encumbered by debt, circumstances pertaining to the fourth motive can apply to all owners.

In large scale urban settings such as Los Angeles and San Francisco, there is an active and reasonably competitive real estate market for brick buildings. Unreinforced structures, lacking compliance with nearly all contemporary codes and standards, are difficult to purchase with conventional loans and are even more stringently reviewed and often declined by insurance carriers. Therefore, **the unreinforced brick building market operates in many respects like a rural real estate market for the purchase of undeveloped land -- it is difficult to obtain conventional mortgage financing and, therefore, buyers and sellers often arrange land contracts or contracts of sale for the exchange of these types of properties.**

In urban areas, unreinforced buildings are often sold for high prices -- prices well beyond comparable square footage for buildings that conform with current codes -- but on terms which enable extended low interest payments in some type of contract arrangement. How does this arrangement work and what benefits are realized by buyers and sellers? First, sellers benefit through 1) obtaining the income of the sale through principal payments realized as capital gains and 2) by collecting interest, a portion of which (in higher income brackets) is taxed as ordinary income resulting in more retained capital and lower taxes (compared to principal taken as capital gains). Buyers also benefit from the exchange by paying inflated prices (in relation to actual building value) and recouping investments rapidly through depreciation allowances. For the buyer, the lower interest rate (compared to prevailing rates) negotiated in a contract sale effectively appears to decrease the cost of the building in relation to its value.

What happens to this arrangement if substantial upgrade investments are required? The value-cost basis equations can be seriously skewed, suddenly and without a clear method for recovering upgrade costs. **Throughout California (with some exceptions), unreinforced buildings tend to be occupied by either businesses and industries that are marginal and must maintain low overhead rates to avoid failure or by renters that are poor, old, minorities, or disadvantaged. Few of these tenants have the ability to absorb larger rent increases that building owners would have to impose to recover strengthening costs.**

The economic benefits to both owners and tenants that appear to be the product of the unreinforced masonry building market could be modified by an upgrade requirement that would disrupt the existing balance between building owners and occupants. In comparatively wealthy communities where downtown locations with unstrengthened buildings can support repayment of upgrade costs through increased lease revenues (e.g. West Los Angeles, Santa Barbara, Beverly Hills, portions of Glendale and Pasadena), this balance between owners and tenants is more stable and less precarious.

However, in parts of downtown Ventura where rental space can be obtained along Main Street for less than \$.65 per square foot (in some cases) to about \$1.00 or \$1.25 for more desirable space, the increased costs of a substantial upgrade program could have potentially chaotic results including:

- **change of unstrengthened building valuation;**
- **displacement of marginal businesses;**
- **relocation of tenants;**
- **termination of businesses;**
- **increase in available space;**
- **interest and principal payment failures;**
- **renegotiation of contract debt; and**
- **general loss of economic vigor.**

These economic displacements may be relatively short-term or they may be sustained. The first possible consequence -- a change in the market value of these types of buildings could have also have very adverse consequences for some owners.

In many respects, the value of unreinforced buildings throughout California are unreasonably high compared to buildings of comparable worth, size and configuration. Unstrengthened buildings are a potential source of considerable business and personal injury liability; they are subject to partial or complete damage in an earthquake; they are exchanged and sold outside of the mainstream real estate market; and they have limited occupancy value since a major change of occupancy in most cities requires some form of

strengthening. **Despite these disadvantages, the market for unstrengthened buildings -- until recently -- was relatively vigorous.**

An ordinance requiring strengthening certainly has the potential to disrupt the relatively delicate balance that presently exists between building owners and their often economically marginal tenants. The substantial capital gains income benefits that ownership and exchange of these buildings has engendered in the past could be reversed. Thus, building owners -- anticipating that income losses could be large -- have often vigorously opposed upgrading programs that require significant investments. **Due to the marginal nature of some downtown Ventura business tenants, the potential for disruption should be considered a substantial problem of considerable complexity.**

12.4 The Life Safety Goal: Is it Achievable and Which Alternative Provides the Most Effective Life Loss Protection?

Based on the evidence presented in Chapters 6 and 7, the answer to the first question is a simple yes. The answer becomes more complex when a corollary question is raised: how much life safety enhancement will occur with each level of possible strengthening? This question has also been answered (see chapters 7 and 11). With the most stringent standards, life loss is reduced dramatically; with adoption of intermediate standards (such as **Level II** requirements), considerable improvement in life loss is achieved. However, as **the analysis in these chapters demonstrates, only a Level III ordinance effectively achieves the goal of life safety. Other standards are simply not as effective. The Level III proposal also assists in reducing building damage even if a strong earthquake occurs.**

Keeping in mind that even if the most stringent levels of strengthening are imposed, some life loss is likely to occur in a strong earthquake, the final life loss question can be phrased simply as: How much is a human life worth? With very great expense on the part of building owners and the City, loss of life can be reduced very substantially--to only a few individuals even in the event of a strong quake--but at very considerable cost. The degree to which life loss is judged to be acceptable has become a cost benefit question that has resulted in numerous conflicting estimates of the economic value of an individual life. The underlying question to the life safety debate is: how much burden can be placed on a building owner to prevent a future occurrence, an earthquake related death, a rare event for which the owner is not responsible? **Based on a comparison of risks from earthquakes and all other sources of death, accident, and illness (see chapter 7), the risk of death by earthquake is very low.**

Countering the life loss fear, building owners often assemble information about the life loss risks from unreinforced buildings compared to deaths from other building types. This line of argument basically states that life loss risks are omnipresent hazards and that the risks from earthquake deaths are small compared to other sources of risk. Building owners ask: why require an expensive upgrade to reduce a risk that is less probable than other everyday events? Like nearly all polemical questions, there is no satisfactory answer--in part because the question has been phrased in a way that prevents an objective response. The more appropriate question is: How much of a reduction in life loss is the design goal?

Even though the question is polemical, the building owners question deserves a forthright answer. **Table 12-1** presents a summary of the estimated total fatalities from a selection of the most important earthquakes in the Western United States (source: Rutherford and Chekene, Personal Communication) that have occurred since 1857. This table also provides the number of these fatalities attributable to unreinforced building failures. Two conclusions are evident from this table: first, since 1950, **only about 10% of the total number of deaths that have occurred in major earthquakes are attributable to the failure of unreinforced buildings.** If fatalities prior to 1950 are included in the computation of fatality rate, the total percentage of deaths attributable to unreinforced buildings is substantially higher--roughly 40%. However, the rate since 1950 (about 10% of total fatalities) more accurately represents current risk conditions.

The contention that unreinforced buildings are **not** the most hazardous structures or facilities to occupy in a California earthquake has some basis in the evidence (considering current trends since 1950 only). As **Table 12-1** demonstrates, unreinforced building failures are only one of several dangerous or life threatening hazards during a major earthquake. **As the Loma Prieta quake demonstrated, building failures are not the only nor necessarily the most serious earthquake hazards.**

However, of the building types in Downtown Ventura that may generate fatalities during an earthquake, there is no doubt that unreinforced buildings are the most dangerous structures in the downtown area. The evidence in **Table 12-1** also indicates that the fatality rate associated with this building type has been reduced through time (resulting at least partially from the decrease in building stock and demolitions and the increase in other types of hazards). Even with the trend towards reduced death rates through time, comparing these risks to the hazards associated with failure of a single 100,000 square foot non-ductile concrete building (such as the structures that collapsed so frequently in the Mexico City quake of the last decade), the hazards of unreinforced buildings appear to be relatively modest.

However, even this conclusion is misleading. When the fatality figures in **Table 12-1** are adjusted to a standardized rate (e.g., fatalities per 100,000 square feet of each building type), the conclusions regarding the hazardousness of these types of buildings can be interpreted quite differently.

Table 12-1
Fatalities From Earthquakes in the Western United States

Event		Fatalities		
Location	Year	Total	Estimated from URM Bearing Wall	
Fort Tejon	1857	1	1	
Hayward	1868	30	15	
Owens Valley	1872	27	13	
San Francisco	1906	700-800 (+)	200-500	
Santa Barbara	1925	12-14	< 10	
Long Beach	1933	86-100	50-80	
Imperial Valley	1940	8	4-8	
Puget Sound	1949	8	4-8	
Kern County	1952	14	5-10	
Alaska	1964	125	< 5	
Puget Sound	1965	3	1-3	
San Fernando	1971	58	1	
Idaho	1983	2	2	
Whittier	1987	3	0	
Loma Prieta	1989	62	8	
Totals		1,191	491	(41%)
Since 1950		257	25	(10%)

Using seismic model results generated for two other cities with unreinforced buildings, San Francisco and Santa Monica, it is possible to consider the relative hazard of life safety in several different building types.

Table 12-2 presents annual risk predictions for fatalities associated with possible seismic events in these two other cities as well as Ventura.

This table presents total expected fatalities (based on the probability of an event in any single year within the next decade) for the three cities standardized by population size. **A further standardization by total area of unreinforced buildings indicates that the annual risk factor in all three cities are similar but the life safety hazards in Ventura are clearly less significant than conditions in San Francisco or Santa Monica. This difference merits consideration when evaluating what type of standard or mitigation program to adopt.**

The probability of fatalities occurring on an annualized basis in Ventura is less than a similar probability for the other cities considered. This risk is decreased because of the increased seismicity, higher building occupancies, higher density pedestrian counts per 1000 lineal feet of sidewalk, and because of the larger building inventory in San Francisco.

Table 12-2
Annual Risk of Fatalities from Unreinforced Buildings in Several California Cities

	San Francisco	Ventura	Santa Monica
Total Expected Fatalities Per Year	12.6	0.12	0.27
Population	700,000	92,000	90,000
Annual Risk per 100,000 population	1.8	0.13	0.42
Area of URM, San Francisco	36,209,808	752,508	1,137,500
Annual Risk per 100,000 Sq. Ft.	**0.033**	**0.016**	**0.024**

Finally, in response to building owner representations that unreinforced buildings are no less safe (or perhaps more safe) than other building types, **Table 12-3** was assembled (using data from the San Francisco area provided by Rutherford and Chekene). This table uses damage and fatality rates derived from ATC-13. The use of the standardized fatality estimates contained in the ATC-13 study is subject to controversy. In the opinion of the consulting engineers, Rutherford and Chekene, the fatality rates used in this study for tilt-up and concrete buildings are unrealistically high. Because of the collapse mechanisms possible with non-ductile concrete structures, the fatality rates for these structures may turn out to be higher than other building types, even though only a few of these types of buildings may collapse.

The comparison of annual risk fatality rates for various types of buildings in San Francisco confirms that the fatality rates for unreinforced buildings are higher than rates for either tilt-up or non-ductile concrete structures. Therefore, even though total deaths from unreinforced buildings since about 1950 have averaged only 10% of the total number of fatalities in recorded earthquakes, from the standpoint of life loss probability, unreinforced buildings still represent a far greater life loss hazard than either tilt-up or non-ductile concrete buildings, two other types of structures whose failure has resulted in fatalities.

Table 12-3
Comparison of Relative Annual Risk of Fatality Per Square Foot Of Various Building Types in Various Cities

Building Type	Occupancy Rate/1000 sf	San Francisco	Oakland Downtown	Oakland Near Fault	Livermore	San Rafael
Tilt-up	1.0	0.9	1.5	2.0	0.8	0.4
Masonry	2.1	15.0	34.0	52.0	12.0	7.0
Nonductile concrete	2.3	2.8	5.4	8.0	2.5	1.4

Summarizing the results of this review, it is apparent that unreinforced buildings are a serious hazard and source of life loss. Fatality rates associated with unreinforced buildings during earthquakes in California since 1950 have averaged about 10% of total earthquake induced deaths. As a percent of total deaths, unreinforced buildings are a declining problem--but, when compared to hazards associated with several other building types prone to quake failure, death rates are still higher for unreinforced buildings than for other structures. The value of life loss can only be estimated if considered generically. Placing a human life in a cost to benefit equation is inappropriate. The proper question is: how much life loss improvement is appropriate given the costs of various levels of upgrade.

12.5 Summary of Ordinance Options That Could be Adopted by the City of Ventura

In the following summary, the ordinance options that could be adopted by City Council are reviewed. The salient advantages and disadvantages of each approach are described and compared to other options. This chapter concludes with a recommended course of action that, in the consultant's judgement, takes into account most of the essential physical, legal and economic constraints and unique conditions characteristic of Ventura.

Option 1: The No Project Alternative or Minimal Compliance Alternative

The adoption of a statewide requirement to inventory unreinforced masonry buildings and establish a locally derived program to mitigate the risks of these structures has created considerable stress and confusion in some communities, particularly California's oldest cities where unreinforced buildings often comprise a major part of a city's "oldtown" building inventory. The local jurisdiction decision approach to the upgrade problem was reconfirmed by the California legislature with the recent defeat of an Assembly bill designed to set a statewide reinforced standard based on the State Model Ordinance. The legislature's message is clear: do something about the problem but make arrangements and define standards on a case-by-case, city-by-city basis. **The No Project Alternative is not a legally viable option; some form of mitigation must be adopted to comply with State Law. In addition, as discussed in prior Chapters, the adverse effects of the No Project alternative would potentially be very severe and result in substantial life loss and building damage.**

Leaving the implementation of this program to local municipalities has created an interesting policy vacuum because most local business, community, or public interest groups do not consider earthquake mitigation problems as significant on the local community agenda. As a result, local planning and building department staff members (and ultimately, City Councils) find themselves opposed by a combination of tenant and building owner interests who oppose increasing seismic safety standards. This interesting reversal of the typical drive towards the adoption of new policy at the local level has created a difficult set of stresses as

demonstrated by the general contentiousness of this issue and the post-ordinance adoption legal and technical problems encountered by cities such as Long Beach, Santa Barbara, West Los Angeles, and Los Angeles. Typically, new policy at the local level is accompanied by:

- a group of advocates willing to allocate time, money, and effort toward policy formation;
- opportunities for advocates to encourage the adoption of their proposals;
- a supportive climate of opinion and organized constituencies pressing for change; and
- the participation of the media in framing, educating, and organizing public opinion.

The first of these prerequisite conditions is not present at the level of local government concerning seismic strengthening of older buildings; in fact, if any constituency exists regarding adopting seismic policy, it is the constituency of resistance to adoption of the standards. **What this constituency broadly fails to be conscious of (across the state) is that not to adopt a seismic upgrade standard, or to adopt an insufficient standard, is indeed a policy -- but a policy based on ignorance and wishful thinking. It is a policy approach that simply does not want to consider what is a calculated and predicted inevitability.**

Academic studies of earthquake hazard reduction (Rossi et. al., 1982; Cambright 1982, Wyner 1981) have all concluded that the seriousness attributed to natural hazards is low and consequently, these hazards are generally politically unimportant to local governing bodies and their constituencies. All of these studies of mitigation programs stressed the role of entrepreneurship among building officials with strong commitments to upgrading public safety. **These studies also concluded that local political officials generally perceive (perhaps correctly) that addressing seismic strengthening fails to yield political benefits. Strengthening technology debates are certainly not the substance of effective political campaigns and there are few incentives to pursue viable solutions that ultimately cause confrontation between local business interests and governing bodies.**

Nonetheless, despite the political uncertainties of ordinance adoption, some form of mitigation program can and should be adopted. **The No Project alternative is neither an environmentally superior or intelligent option. Although very minimal compliance with the State law has been achieved by the City of Ventura, without some form of mandatory strengthening, the impacts of moderate to strong quakes on the City could be profoundly adverse as described in prior chapters. From a policy standpoint, the partial compliance No Project option has a number of disadvantages which have been enumerated in prior chapters.**

In summary, the no mandatory strengthening option -- or, in formal CEQA parlance -- the No Project Alternative, is in fact a policy. It is a policy based either on ignorance or a conscious decision to ignore the potential consequences of an earthquake. Given the clear evidence of severe social and economic impacts on communities such as Watsonville and Santa Cruz given an earthquake similar to what is likely to occur in Ventura, failure to adopt a strengthening program is simply not a viable option without ignoring both comparative and predictive data presented in this EIR. The No-Project option would not result in anything more than partial compliance with the State Unreinforced Masonry Law.

Option 2: A Demolition Ordinance

There are a number of policy alternatives for unstrengthened buildings that have not been given serious consideration statewide because they have the potential to engender more conflict and less consensus than the options being considered by the City of Ventura. The most contentious of these possible options is a demolition ordinance. Perhaps the simplest way to solve the problem of unreinforced buildings is simply to demolish them over a time period that is sufficiently long that 1) building owners would be unsuccessful in litigating a challenge that such an ordinance is a taking without compensation and 2) adequate time would be provided for building owners to dispose of their buildings in a manner that would not generate substantial

hardship. A demolition ordinance with a 20 year compliance time frame would provide a reasonable span of years for owners to dispose of their buildings. This option would gradually remove the problem of unreinforced buildings from the community. Demolition would, of course, permanently alter the historic fabric and streetscape of the City.

Some building owners and other opponents of the Ventura ordinance proposals described in the Project Description have argued that nearly any form of required strengthening would ultimately result in large scale demolition of unreinforced buildings. To this interest group, any strengthening option is in essence a demolition ordinance. This may indeed be the case, depending on how extensively a building is leveraged (ratio of debt to equity) and other economic concerns. Building demolition is a frequent consequence of ordinance adoption. This sequence of events has occurred in some cities, especially in jurisdictions where very stringent upgrade requirements have been imposed, such as in the City of Long Beach. Since enactment of the Long Beach ordinance, by the late 1980s nearly thirty-five percent of the building inventory had been brought into compliance with the ordinance, and the percentage has consistently increased annually. Much of the remaining 60% of the building stock (much of it residential) is to achieve compliance with upgrade standards by 1991. Compliance was largely achieved by demolition. The Long Beach upgrade standards are more intensive than those adopted by Los Angeles and of the total inventory of buildings in the City of Long Beach, only about one-third of the higher risk building owners opted for compliance by upgrade. A considerable amount of the demolition work performed in Long Beach was completed coincident with major redevelopment planning.

In contrast with the Long Beach ordinance which encouraged demolition, the Los Angeles ordinance has resulted in an active rehabilitation program for the nearly 8,000 unreinforced buildings in the building stock at the time the ordinance was passed. In the first half decade after passage of the Los Angeles ordinance, a ratio of upgrading to compliance of about 3:1 was characteristic and this ratio reflects current trends as well. The Los Angeles ordinance with its program of compliance by stages (e.g. Level I within a specific time frame followed by a Level II standard within an extended time frame) has provided building owners with greater flexibility in planning whether to retain and upgrade or dispose of a building through sale or demolition.

There are several **demolition** alternatives, some of which, based on a value analysis reported in Alesch and Petak (1986:161) may be acceptable to building owners. Several demolition alternatives have been considered by several municipalities and discussed in the literature. These alternatives include:

- o demolition of all unstrengthened brick buildings within one year;
- o phased demolition over a 2 or 3 decade time frame; and
- o immediate demolition of selected high risk/high occupancy buildings and phased demolition of moderate risk/lower occupancy structures.

In an extensive analysis of various ordinance options including and excluding demolition reported in Alesch and Petak, most building owners ranked a program involving installation of wall anchors (a Level I type of improvement) and mandatory demolition within 25 years as being preferable to a typical Level II or III strengthening without demolition. The 25 year time frame would allow even the most conservative (i.e., non-speculative) owners an opportunity to clear or substantially reduce existing debt prior to demolition.

As a long-term solution to the unreinforced building problem, in the consultant's opinion, a partial strengthening solution with mandatory demolition in a 20 year time frame is a reasonable approach to the problem if 1) the ordinance also includes a Level III type standard with which owners could comply to avoid demolition, and 2) if provisions are made for the preservation and strengthening of several classic historic or architecturally significant buildings. For Ventura, this option may have some realistic value given the considerable improvements in building damage and life loss that is achieved with a Level I upgrade (assuming the most probable event -- an earthquake on the San Andreas). If such an approach to the problem is adopted, only a worst case low probability earthquake in the Pitas Point - Ventura fault would

potentially cause a large number of fatalities or damage buildings in the City seriously. If such a low probability earthquake does occur in the next 20 years, between 60 and 75% of the inventory, ultimately would be destroyed or damaged to a point that repair is not practical. City Council may judge that this risk may be worth taking. Imposition of a Level I upgrade requirement with mandatory demolition in 25 years or completion of a Level III upgrade to avoid demolition, would probably have far less significant economic consequences for the downtown business core. **This alternative is probably best summarized as mandatory immediate Level I upgrade with demolition required within 20 years.**

Building owner responses to this option (in Los Angeles) were generally favorable. Summarizing their value analysis of this option based on building owner judgments, Alesch and Petak concluded (1986:163):

> ". . . . [I]n the major areas of concern (economics and tenant impacts), [the results] point uniformly in the direction of no ordinance as the best alternative [from an owner's perspective], followed by the alternative requiring demolition in 25 years and wall anchors [Level I] . . . . with the [Level III] ordinance and [a] demolition ordinance being distant losers."

The other approach to a demolition ordinance--requiring upgrade requirements that are realistically too expensive to implement--would have little merit or value to the City or community unless a long timeframe is attached to this requirement which enables building owners adequate time to either clear debt before demolition or to raise funds to accomplish a comprehensive strengthening program.

Immediate or near term demolition, if applied in the City of Ventura, would result in the large scale clearance of buildings from a six block area. The consequences of such a social, economic, and environmental demolition program, even if phased over a two year period or applied only to high and moderate risk buildings, would be unacceptable.

Option 3: Adoption of the State Model Ordinance (**Level III**)

As recently amended, the 1990 State Model Ordinance provides considerable flexibility in designing strengthening programs. The current ordinance also incorporates several experimental and less expensive approaches to reinforcement. Several cities in southern California have adopted or intend to adopt the model ordinance (e.g., West Los Angeles, Santa Monica) as the remediation standard for upgrades. For the City of Ventura, adopting the Model Ordinance has several advantages and three significant drawbacks. **The advantages of this approach include:**

- **this option would provide substantial design flexibility and would enable considerable cost reductions (for many types of buildings) compared to other strengthening options;**

- **the costs of Model Ordinance compliance compared to Level II strengthening are relatively similar and, given the additional strengthening obtained through use of the Model Ordinance, from a cost benefit standpoint, this option should be given serious consideration;**

- **a single upgrade program with a defined implementation plan would be applied systematically to all buildings in the City which would avoid the complexities of a program with different upgrade requirements based on hazard variables such as street exposure for pedestrians, occupancy values, and other risk factors;**

- **the increasing use of the Model Ordinance as a design standard throughout the State increases the legitimacy of the ordinance if it is subjected to legal challenge.**

The Model Ordinance also has some significant drawbacks in its current form when applied to the specific, unique conditions in Ventura. **Problems with implementation of this approach to the problem include:**

(1) **the ability of buildings strengthened to Model Ordinance standards to withstand ground accelerations amplified by soil conditions or liquifaction potential has not been demonstrated and these factors were not taken into account in the design of this ordinance;**

(2) **the costs of strengthening to these standards would potentially be excessive (from a cost to benefit standpoint) for low risk, low occupancy buildings of small dimension and only minimal pedestrian exposure--and possibly for several other building types;**

(3) **the design standards in the Model Ordinance would probably not assure the preservation of some of the most architecturally important and historically significant buildings in the City's inventory;**

(4) **the model ordinance does not contain unique provisions for buildings with party walls, a very important problem in the City of Ventura.**

Given the relative advantages and disadvantages of this approach, without some modification, the adoption of the Model Ordinance may not actually address the problem of inadequate foundations, concern with historic building stock preservation, or party wall problems that characterize such a large portion of the Ventura inventory. **For these reasons, without some modifications, adoption of the State Model Ordinance is not recommended. With the passage of AB 204, the objections cited above, although still relevant from the standpoint of design, are irrelevant administratively since AB 204 will be incorporated into the local building code by default in July of 1993.**

Option 4: Adoption of Level I Strengthening

From the standpoint of cost to benefit ratios, Level I strengthening will do more per unit of cost to improve the life safety of the buildings in the City to acceptable levels than other options. However, **this Level of strengthening has many significant problems:**

- **historic building stock would not be preserved if a strong quake occurs;**

- **life loss and building damage would not be reduced significantly if a movement occurs on the Pitas Point-Ventura fault;**

- **the interaction of soil amplification or liquefaction potential is not taken into account in the Level I strengthening program and therefore the degree of damage reduction predicted by the Seismic Risk Model may be overestimated;**

- **the interaction of adjacent buildings and party wall problems are not accounted for in this option;**

- **the costs for Level I strengthening, when premiums are applied for historic conservation and/or strengthening with tenants in place, are roughly equivalent to Level II upgrades; and**

- o **the participation of the City in funding upgrades to this level of strengthening would be more difficult to rationalize or justify since even though life loss reductions would be achieved, preservation of building stock and minimization of economic effects on the downtown would not be accomplished in the event of a strong quake.**

Taking all of these advantages and disadvantages into account, adoption of Level I standards is not recommended for most of the City's building inventory. **The City could consider permitting use of Level I upgrade standards if an unreinforced building meets the following criteria:**

(1) **it is a low occupancy building with only minor pedestrian exposure;**

(2) **it contains a substantial internal diaphragm structure;**

(3) **the owner agrees to upgrade to higher standards if a change of use or occupancy occurs; and**

(4) **it has no buildings immediately adjacent (i.e., it is free standing) that could be effected if bearing walls fail outward.**

In cases where a building owner can verify that these conditions are met, use of a Level I standard may be appropriate. However, both the City and the building owner should understand that this solution is only interim and any change of use in the future would require further upgrade work unless the new use is similarly low occupancy, low density, and low risk.

In response to this suggestion, City staff and the consultant refined the criteria that could be used to permit a **Level I** upgrade without seriously compromising building damage or life loss reduction efforts. After considerable study, City Building and Safety staff and the consultant concluded that buildings meeting the following requirements would qualify for the **Level I** upgrade criteria. The entire building inventory was sorted to identify qualifying structures. Buildings were qualified for a **Level I** upgrade if they met the following conditions:

1) no unreinforced masonry party walls could be present on any side of the qualifying structure;

2) no **A or E** (Assembly or Educational) uses would qualify;

3) no **R or B** (residential occupancies) would qualify if occupant loads were greater than 150 persons;

4) no immediately adjacent buildings lower in height could be present;

5) no designated historic buildings were included; and

6) no buildings fronting the areas with higher pedestrian exposure along Main Street (200 to 600 block) were included.

Qualifying low risk buildings included in the study program for the EIR are identified in **Table 12-4. Adoption of a Level I standard for these buildings may be an efficient way to reduce life safety risks at minimal cost.** This Level of upgrade would only provide partial reinforcement and, in the event of a very low probability movement on the Pitas Point-Ventura Fault, adoption of this standard may only provide very partial damage reduction or prevention of fatalities. **As long as this standard is adopted with an understanding of its limits and if the standard is not applied to all portions of the City, it was considered a reasonable and recommended approach to the problem in the Draft EIR.**

However, with the passage of AB 204, the adoption of partial strengthening standards which are less encompassing than the Level III standard raises complex legal and administrative questions. For this reasons, adoption of a Level I standard is no longer a recommended course of action.

Option 5: Level II Strengthening

As detailed in Chapter 6, Level II strengthening would probably substantially reduce building damage and life loss if an event occurs on the San Andreas fault; however, with more powerful ground accelerations from a movement on the Pitas Point-Ventura or other faults in the seismically active Santa Barbara region, Level II strengthening would not provide substantial additional improvement in life safety or building damage reduction. **Based on the City Building and Safety staff review of the building inventory, relatively few if any structures included on the Level I recommendation list (Table 12-4) would require Level II upgrades because these buildings do not generally meet the criteria that generates the need for Level II standards (e.g., open store fronts). In addition, since another Level of upgrade is recommended for the Main Street corridor, the utility of this standard is very small.**

Moreover, as illustrated on the graphic presentation of model results, only a **Level III** (Model Ordinance) strengthening program would achieve the maximum possible improvement in building damage and life loss reduction. In addition, as explained in the analysis of various cost options, the cost differential in implementing **Level III** standards (compared to **Level II**) is not particularly significant. Furthermore, the participation of the City would be unwise in assisting with funding upgrades unless some more intensive strengthening is achieved than what would result from **Level II** upgrades. Finally, as discussed in Chapter 8, after review of Loma Prieta quake building damage assessments, the author of the technical provisions for the Ventura **Level II** standard concluded that at least some aspects of the **Level II** program were probably not warranted. **Therefore, taking all of these variables into account, the use of the Level II standard is not recommended. Moreover, with the passage of AB 204, the adoption of partial strengthening becomes an unwise and imprudent course of action.**

Option 6: A Multi-level Ordinance

The adoption of an ordinance that requires and permits various levels of upgrading in different parts of the City was the consultant recommended course of action in the Draft EIR. Under this approach, the following actions were proposed:

(1) All of the buildings in the City would be classified on the basis of potential hazard generation (exposure of pedestrians, occupancy, clearance around the building, absence of adjacent buildings that could be damaged by a wall collapse--refer to the criteria in Option 5 for **Level I** qualifying factors); **buildings that satisfy these explicit Low Risk criteria would be permitted to upgrade to Level I** standards (**52 buildings or about 40% of the inventory**).

(2) All buildings with adjacency problems, party walls, heavy street or alley pedestrian exposure, and or other unique hazard problems would be subject to **modified Level III standards** that will have to be designed to take into account party wall and soil problems in the Downtown Community. Additional engineering studies should be performed to define the most cost effective and damage reducing program that can be implemented in the Main Street corridor. The scope and general framework for this program should be defined before an ordinance is adopted. The recommended boundary of the Main Street corridor study area is shown in **Figure 9-1.** The City should participate in coordinating implementation of the upgrade for buildings in the Main Street Corridor and in areas with contiguous buildings that satisfy these criteria due to the legal and structural complexities created by party walls and other adjacency problems. **It is likely that between 50 and 60% of the building inventory meets these criteria.**

Table 12-4

Buildings Eligible for Level I Upgrade Standards

ADDRESS		OCC.	CODES	OCC OC LOAD	LEVEL	TOTAL AREA	OWNER	BUSINESSES	
26	CHESTNUT ST S	B		1	I	728	CHESTNUT PROPERTIES LTD	THEATER MECH EQ.	
111	DOS CAMINOS AV S	B		3	I	1,349	VAVRUCHE JAMES*-JUANITA*	KAWASKI WHSE	
180	GARDEN ST N	H		36	I	3,626	BAKER MYRON E-ADELLA M	WOODWORKING	
273	HEMLOCK ST S	B	B	31	I	7,740	MAC LEOD GEORGE-REBECCA TR	WAREHOUSE	OFFICE
283	HEMLOCK ST S	B		44	I	4,350	MAC LEOD GEORGE-REBECCA TR	OFFICE-MCLEOD	
710	MAIN ST E	A		743	I	5,200	CH SCIENTIST FIRST CHURCH	CH. SCI. CHURCH	
804	MAIN ST E	B		17	I	1,742	ACUNA ALEJANDRO M	4 DAY TIRE	
879	MAIN ST E	B	R	95	I	6,427	PARSA DARYUSH J	FOWL PLAY	
952	MAIN ST E	R	R	12	I	2,500	MARTIN JERRY P-MARY L	APTS - 4	
981	MAIN ST E	B		50	I	1,504	REGAN LUCILLE E TRUST	ARROW RENTS	
1,294	MAIN ST E	B		19	I	1,900	ELARDO ANGELO-HELEN J	ELARDO DDS	
1,418	MAIN ST E	B		257	I	7,695	GILMAN RICHARD	ACE LOCK	
1,474	MAIN ST E	B		69	I	2,067	BARKER FAMILY TRUST	CANDY'S BAZAAR	
1,484	MAIN ST E	B		34	I	3,435	BARKER FAMILY TRUST	MULTI OFFICE	
1,532	MAIN ST E	B		203	I	6,100	HANTGIN JIM ET AL	ISENSEE FLOOR	
1,721	MAIN ST E	B		68	I	2,052	PATISAUL JUANITA J	JUANITA'S INTER.	
1,730	MAIN ST E	R	B1	12	I	2,576	KINGSTON NELL W TRUST	4 APTS	GARAGES
1,783	MAIN ST E	B		81	I	2,442	FEAR WILLIAM-MILDRED TR	DEES SUN. INTER.	
1,880	MAIN ST E	B		72	I	2,174	WILLIAMS CAROL A ET AL	JOHN'S MUSIC	
28	MAIN ST W	B		110	I	3,302	ADDISON ROBERT-JANET TRUST	J H FLOORS	
72	MAIN ST W	B		0	I	2,250	REDEV AGENCY-SBV	VACANT	
29	OLIVE ST N	B		60	I	6,000	PUBLIC WORKS INC	PUBLIC WORKS	
29	OLIVE ST N	B		6	I	3,216	PUBLIC WORKS INC	P W WAREHOUSE	
701	SANTA CLARA ST E	B		261	I	26,090	PACIFIC TEL-TEL CO	PAC TEL OFFICE	
1,001	SANTA CLARA ST E	B	R	148	I	7,650	NGUYEN HOI THI	ASIAN MARKET	APT
1,019	SANTA CLARA ST E	A		186	I	2,790	NGUYEN HOI THI	HACIENDA	
1,047	SANTA CLARA ST E	B		7	I	1,360	ABBOTT C NEIL-MAUREEN	PARKING GARAGE	
10,269	TELEPHONE RD	A		200	I	0	LOYAL ORDER MOOSE LODGE 1394	MOOSE LODGE	
154	THOMPSON BL E	B		50	I	1,505	KEHR FRANK W	WAVELINE SURF	
558	THOMPSON BL E	R1		50	I	10,040	PECK WILLIAM L	APTS - PECK	
585	THOMPSON BL E	B		45	I	4,497	JC PROPERTIES	LEON'S TRANSMISS	
1,241	THOMPSON BL E	B		44	I	4,375	MAC LAREN TRUST	YBARRA TIRE	
1,695	THOMPSON BL E	I		17	I	1,364	MORALES CELESTINO-CARMELITA	REST HOME	
1,794	THOMPSON BL E	B	B	75	I	3,450	TAYLOR RICHARD L-KRISTIN W	NOYES PLUMBING	DOMINO'S
1,887	THOMPSON BL E	B		40	I	1,200	VIZZO AGNES	VIZZO PLUMBING	
2,006	THOMPSON BL E	B		59	I	2,251	POULOS DIMITRIOS P-BRIGITTE	LIN. & CARP. CTY	LIN. & CARP. CTY
2,036	THOMPSON BL E	B	R	20	I	1,080	HOWE CHARLES W	SOLARIS LIQUOR	
2,037	THOMPSON BL E	B		84	I	2,500	LYSKIN VICTOR A-EMILY B	VIC'S PLUMBING	
2,160	THOMPSON BL E	B		147	I	4,410	PRICE M H-C M FAMILY TRUST	PRICE AMERITONE	
2,170	THOMPSON BL E	H		85	I	5,000	NEVILLE ROBERT D	NEVILLE AUTO REP	
159	VENTURA AV N	H		68	I	6,780	PROSSER J E-A B TRUST	RV REPAIR	
172	VENTURA AV N	B	R	123	I	3,382	PRANIS FAMILY TRUST	JOHNNIES	APT
375	VENTURA AV N	B		92	I	2,788	GOLD COAST RENTALS	KIRBY VACUUM	
390	VENTURA AV N	A		133	I	2,000	KARPAN HARRY L ET AL	ROCK HOUSE	
401	VENTURA AV N	B		91	I	2,728	BOYD DOROTHY D TRUST	AVENUE TV	
404	VENTURA AV N	B		37	I	3,737	BELL MATTRESS FACTORY INC	BELL MATTRESS	
421	VENTURA AV N	B		100	I	3,000	GARCIA RICARDO-KATHLEEN	MAYA'S DELI	
464	VENTURA AV N	B		108	I	3,230	WADEMAN ROBERT	VENTURA GLASS	
545	VENTURA AV N	B	R	36	I	8,580	ACOFF FAMILY REV TRUST	WAREHOUSE	APT
591	VENTURA AV N	B		34	I	3,360	DATA FIVE INVESTMENTS LTD	DATA GRAPHICS	
1,290	VENTURA AV N	B		24	I	2,400	ESPOSITO FRANK TRUST	COIN LAUNDERY	
79	VENTURA AV S	B		11	I	1,100	SOUTHERN CALIF EDISON CO	SCE	
	TOTAL # OF UNITS	52	GRAND TOTAL AREA			203,022			

(3) A selection of historic buildings (see chapter 9) would be upgraded to **Level III** (or higher) standards to assure preservation of a selection of the historically and architecturally most significant buildings in the City. **Based on the information provided in chapter 9, 11 buildings would be subject to this provision (about 12% of the total building inventory).**

(4) Any buildings not upgraded to modified Level III standards would be required to comply with this standard if a change of occupancy or use occurs. The specific criteria that need to be addressed regarding further upgrading if a change of occupancy occurs could be left to the discretion of the City Building and Safety staff.

(5) Demolitions and like for like replacement should be permitted into the indefinite future to diminish the likelihood of a challenge to the ordinance based on the theory of taking without compensation or other types of challenges.

In the Draft EIR, adoption of a multi-level upgrade standard was recommended by the consultant as the environmentally superior project. With the passage of AB 204, the adoption of this alternative was determined to be an unsatisfactory solution to the upgrade problem. Also, the economic analysis suggested that although affordable for some, many building owners in the downtown area would have considerable difficulty complying with a mandatory Level III standard without some form of assistance. Tenant effects with implementation of the Level III standard with continued occupancy would also be significantly adverse. For this reason, **another alternative was derived which took into account the passage of AB 204 and the economic data obtained during the preparation of the Final EIR.**

Option 7: The Environmentally and Economically Superior Alternative

Taking both the environmental and economic considerations described in the EIR into account, the following option was determined to be the superior alternative. **It is important to stress that from an environmental standpoint only, adoption of the Level III standard would be superior to all of the other alternatives studied. However, the economic analysis suggests that potential economic problems might result from the mandatory implementation of this standard. Due to changes in state law, adoption of a lower order standard (such as a Level I or II program) was determined to be both impractical, fiscally not responsible, and of dubious legal status. Therefore, the following approach to an ordinance was proposed:**

Environmentally Superior Ordinance Recommendation

The consultants recommend that the City consider adopting an ordinance with the following components:

(1) Adopt the Level III Standard into the Building Code

This action would incorporate the UCBC Appendix Chapter 1 into the City's building code. This **Level III** standard **would not** require mandatory strengthening on the part of any building owner; rather, this code adoption would merely set a design standard for effective life safety and building damage reduction that owners could comply with voluntarily on an individual basis as their financial condition permitted (e.g., sale of the building, major investment decision, etc). Given the recent passage of AB 204, this action becomes a requirement with mandatory implementation in July 1993. The City would simply be complying with the new code requirements in advance of mandatory compliance.

Costs to the building owner: None

Impacts on tenants: None

(2) Adopt an Historic Buildings Provision

The ordinance should reference the unreinforced buildings identified in the EIR that have sufficient architectural or historic merit to qualify for City assistance (to the degree that such assistance becomes available in the future). The ordinance should initiate the process of joint City-property owner upgrading and/or restoration of these buildings to a **Level III** standard. The City should consider pursing Mills Act contracts and related financial incentives to assist in implementing the voluntary upgrade of these buildings.

Costs for the building owner: None. Voluntary compliance.

Impacts on tenants: None until the upgrade is performed. Work should be performed during changes of tenancy.

(3) Create a Voluntary Building Replacement Incentive Program

Based on the consultant's economic analysis, some building owners may, if provided with substantial incentives, choose to demolish their buildings and replace the existing structures with new, mixed use buildings that would provide a greater financial return than current earnings. The incentives that the City could consider for owners who agree to demolish and replace their buildings include:

- "like for like" replacement of current square footage with generous modifications for mixed use buildings;
- reduction or elimination of building permit fees for replacement buildings;
- reduction or elimination of parking district fees for replacement square footage;
- reduction of fees on additional construction of residential units above new commercial construction; and
- exempting a percent of new square footage (in addition to the replacement square footage) from fees if the new square footage is applied to mixed use buildings.

These and other incentives should be structured to meet the evolving objectives contained in the Specific Plan (in preparation).

Costs for the building owner: None

Impacts on tenants: None

(4) Require a Structural Analysis of Each Building

A provision should be adopted (similar to the structural analysis requirement in the Palo Alto ordinance) which requires a minimal analysis of the specific earthquake hazards associated with each building in the city. This report need not be overly detailed; the basic justification for this analysis would be to establish clear property owner liability for the existing hazardous conditions.

Costs for the building owner: Variable but about $2000 for a moderate sized building.

Impacts on tenants: None

(5) Adopt Mandatory Parapet Strengthening along Public Ways (streets and alleys) and Other Hazard Reducing Measures

A mandatory requirement for strengthening parapets along public ways (streets, alleys, parking lots) and over building entrance/exits should be required. This program would eliminate the single greatest source of risk to the public from these types of buildings. The City may also consider requiring shatterproof glazing on all open store fronts and other minor non-structural improvements that will reduce earthquake injury risks to pedestrians and building occupants.

Costs for the building owner: Variable, but estimates range from a low of about $20 to $75 per lineal foot. Realistic estimated costs would range from about $1.00 to 1.50 per square foot for a 5000 square foot building. Assuming the front and rear parapets are strengthened on a typical 50 x 100 building, the total cost would range from about $2000 to $7500.

Impacts on tenants: Very minimal to none. Nearly all work is done on the roof and therefore little if any business interference would result. Businesses would not need to close and the pedestrian way would not be affected by the work.

This upgrade would not interfere with or create any confusion with the mandates of AB 204 since the current standard for parapet strengthening is contained in the UCBC Appendix Chapter 1.

12.6 Implementation of the Preferred Option: Timing Alternatives

The option originally proposed in as superior to the project in the Draft EIR (Option 6) has been replaced by a new alternative which would not have a specific mandatory compliance program for **Level III** upgrades. As proposed, the ordinance would encourage the eventual replacement of the current building stock with new buildings of safer construction. Owners not wishing to take advantage of these incentives would, at change of occupancy, time of sale, or some other point of transition, have the option either to upgrade their structures to the new adopted standard in the building code or vacate, demolish, and reconstruct a new structure.

The only mandatory compliance in the present proposal would be to strengthen parapets along public ways. For most buildings, this would amount to strengthening the front and back of a structure only. The City could establish a time frame for implementation of this portion of the ordinance based the on relative hazards of different types of buildings in the City inventory.

The mandatory structural analysis should be required in a timely manner to expedite the transfer of liability regarding these structures from the City to the owner.

12.7 Costs and Complexities in Implementing of the Preferred Option and Variations on this Option

Implementation of some parts of the environmentally superior option will potentially require considerable organizing effort from the City as well as a commitment of staff in the Planning, Revitilization, and Building Divisions for the administrative coordination of the historic buildings portion of the upgrade program. The establishment of a coordinated strengthening program on a block by block basis has been attempted in the past by the City Redevelopment Agency. To provide some perspective on prior attempts to coordinate upgrades and to suggest how such a block-wide program might be coordinated, a review of the Peirano Block strengthening program pursued by the Redevelopment Agency is presented below.

Prior City Attempts to Organize a Block-Wide Upgrade Program

In 1987 the City, with funding from the Redevelopment Agency and a State grant, acquired the Peirano Building. In 1988 Agency staff, working with architectural consultants, developed a master plan for the

entire block. The Peirano Block Master Plan envisioned a public plaza to the rear of the Main Street buildings, a pass through from the rear of the properties to Main Street, and improved parking. To accomplish these improvements, the Agency needed to acquire parts of several properties, demolish the rear portion of the Coalition Against Household Violence Thrift Store and relocate about 2,500 sq.ft. of that businesses use, and relocate a restaurant use and demolish that building to create the pass through to Main Street. The public plaza was to have a Chinese garden theme. The Agency offered to maintain that plaza and alley ways to Figueroa Plaza and Main Street. The plaza design would have provided better trash collection facilities, outdoor lighting and other amenities.

In return, the Agency wanted the property owners of the Main Street buildings to upgrade their properties to Level II and make facade improvements in accordance with Design Guidelines the Agency's consultant had prepared. As an incentive, the Agency offered the property owners favorable loan terms.

There were four major property owners of Main Street buildings. One property owner signed an Owner Participation Agreement, two property owners seemed willing to participate but never committed to the project and one property owner refused to participate at all.

To encourage participation, at various stages of the negotiations, Agency staff offered to coordinate construction management of the upgrading. At other times, Agency staff encouraged the owners to coordinate their projects through one contractor and do the work as one project in the hope of achieving economies of scale. Agency staff also offered to commit to a promotional program to attract people to the area once the improvements were completed.

After several years of frustrating negotiations, the Agency dropped the project. The primary reason for dropping the project was the lack of cooperation by the majority property owners. The other was the perception that even with the improvements, there would be no immediate change in the character of the block and not enough return to the City from additional sales tax.

The City's expectations of specific building owners were reasonable and would have included the following specific obligations for affected individual property owners:

- The Knights of Columbus Lodge was to grant an easement to the Agency for a landscape area adjacent to the public plaza or sell property to the Agency and give the Agency permission to mount interpretive plaques on the north wall of the lodge;

- The Annenberg/Garfield ownership was to sell at fair market value or transfer title of vacant parcel to the Agency at reduced price in exchange for agreement that their future parking requirements would be met (up to a specific number of spaces to be determined);

- The Platt ownership was to agree to sell a portion of this property to the Redevelopment Agency for a plaza, pass through walkway and parking area and to maintain the private portion of the outdoor dining area to a specific standard;

- The Weiss/Meyerstein partnership would have no additional requirements imposed other than upgrade to a **Level II** standard; and

- The Schulze ownership would agree to maintain the private portion of an outdoor dining area to a specific standard; no other requirements were specified other than to upgrade to a **Level II** standard

The City intended to move funds from a variety of capital funds to accomplish the upgrade. The budget proposal included about $450,000 for small area land acquisitions (primarily for parking and open space), $1.3 million dollars for development costs (creation of reconstructed "China Alley", relocation of tenants,

cultural resource mitigation, and other minor improvements). Design fees for upgrade plans were estimated to be $120,000 for the block. Upgrading the Peirano Store building and adjacent Wilson Studio was estimated to cost over $300,000 (due to the poor condition of these buildings). The cost estimates for seismic upgrading of the privately owned properties on the block were estimated to be about $800,000, of which $250,000 would be obtained from private ownerships and $550,000 would be provided to owners as loaned funds. Total project costs, using preliminary estimates, would have been about $2.4 million dollars.

12.8 Funding Sources for Implementing Upgrade Programs

In addition to the Mills Act contract program discussed in chapter 9, there are a relatively large number of possible programs which could be implemented to assist in funding voluntary upgrades both within and outside of the Main Street corridor. This section of the EIR contains a preliminary review of these funding sources.

The availability of financing for seismic rehabilitation programs is relatively limited, particularly if housing units are not involved in the upgrade effort. Many of the available funding sources are used for a variety of development programs other than seismic rehabilitation and competition for these funds is intense. Restrictions on the use of Federal or State funds (such as paying prevailing wages) also limits the amount of rehabilitation that can be achieved with a fixed grant. Most available financing is provided to an agency or a property owner in the form of low-cost loans or partial grants that will not cover the complete cost of rehabilitation. Most likely, a combination of the following public and private financing sources summarized in **Table 12-5** which are discussed below will be needed to help fund seismic retrofitting in Ventura. **As shown in this table, even though a rather large number of programs exist to assist in upgrading efforts, only a small number of these programs have direct applicability for the City of Ventura.**

Community Block Grant Funds

Each year, the City receives approximately $650,000 in Community Development Block Grant funds. These monies could be available to loan or grant to owners who want to upgrade their properties to comply with a seismic strengthening ordinance. **Currently, and for the next few years, the City's CDBG monies are fully allocated to Federal loan repayments and to redevelopment. In the future, however, assuming the CDBG Program continues at the Federal level, some, or all of such funds could be made available through the budget process for unreinforced masonry upgrade work.**

If the City creates a facade improvement subfund for this program, the City could provide grants for facade improvements to businesses located in the Downtown area. This program could presumably be used to fund portions of the proposed Main Street Corridor upgrade. These funds represent an important funding source for upgrades for the approximately 20 unreinforced buildings in the Redevelopment Area.

The City could create a direct grant program (where the grant pays a portion of the total upgrade cost) as an incentive for owners of unreinforced buildings to fund the remainder of their retrofit costs.

TABLE 12-5
Applicability of Upgrade Funding Mechanism for the City of Ventura

Type of Program	Title	Definition/Discussion	Applicability
Federal Funds and Programs	HUD Community Development Block Grant Programs	Using CDBG funds, redevelopment agencies are incorporating seismic retrofit into their redevelopment programs. Deferred loans, direct loans, and combination loans have been financed. Very flexible program.	Not preferred. Funds unavailable at this time. Rehabs would be subject to prevailing wage (Davis-Bacon).
	HUD Rental Rehab. Sections 8 and 312, and Housing Dev. Action Grant Fund Programs	In exchange for certain restrictions on rent in residential buildings, owners can be eligible for federal funding.	HUD Rehabilitation funds are available but limited to very small part of the building inventory (12 buildings total). Section 8 funds are unavailable at this time.
	Historical Facade Easements	A federal program for facade easement prohibits a more intense development for a historical building listed on the National Register of Historical Places while controlling the exterior architectural character. The gift of a preservation easement provides an immediate income tax deduction equal to the reduction in property value attributable to the easement.	Applicable only to several buildings in the Mission vicinity. Possible source of funding but very limited.
	Federal Tax Credits	The largest tax credit given for rehabilitation of buildings is the Federal Investment Tax Credit, which allows a 20 percent tax credit for restoring historical buildings listed in the National Register of Historic Places. Tax credits can reduce an owner's taxes considerably and improve the economic feasibility of a seismic project.	20% credit applicable only to a small selection of buildings. A 10% credit may be available for all buildings.
	SBA Loans	Small Business Administration loans are available up to $588,000 maximum for 1.5 to 2.75 percent above prime interest rates through private lenders, with 90 percent of the loan value is guaranteed by the SBA.	Limited to owner occupied businesses only.

Type of Program	Title	Definition	Applicability
State Funds and Programs	Propositions 77 and 84	These are new general obligation bond programs passed by the electorate in June of 1988. Proposition 77, in a joint program with Proposition 84, allocates $80 million in low-interest loans for the low-income, multiunit residential unreinforced masonry buildings.	Applicable to only a very small number of buildings.
		Demands are low for Proposition 77 because few buildings are eligible and even fewer owners are willing to commit to long-term, low income housing agreements.	These programs involve rent regulations that make the program unappealing to property owners.
		The Commission estimates that only five percent of all URM buildings are residential and only a portion of those have low income housing.	
	Exemptions from Increased Property Tax	This exemption from property tax reassessments applies only to seismic retrofits of bearing-wall URM buildings. Nonbearing wall URM buildings are currently not exempt from property tax increases. Amendments to these exemptions are pending in the legislature.	Applicable to a considerable number of the buildings in the stock. New construction and related improvements would not be exempt. Requires a mandatory ordinance in place to be used.
	HCD Deferred Payment Loans	This program provides loans up to $200,000 but it has not been strongly funded.	Major problem is lack of State funding. Some residential hotels may be applicable.
	HCD Residential Hotel Loan Program	This is a small program of $9.5 million statewide.	
	Mills Act Agreements	State law provides that an owner of a historical building may enter into an agreement with the City or County to restrict the use of the building and require preservation and maintenance in order to reduce property taxes.	Applicable. Requires buildings be on a historic listing such as local landmark or National Register. Potentially a small revenue loss to the City.

Type of Program	Title	Definition	Applicability
State Funds and Programs Cont.	Marks Historical Rehabilitation Act	This offers a financing strategy with low-interest rehabilitation loans for historical buildings.	Applies to a limited range of building types. Owners must concur with liens. Large number of owners must participate. Bonds are taxable. May be some advantage in lending rate.
	Geologic Hazards Abatement Districts	State law allows for assessment districts that can help finance seismic retrofits.	Applicable. Requires 51% owner participation within the District. Assessments would be levied primarily on owners. City participation may be necessary.
	Special Assessment Districts	This type of program would allow building owners to participate in an assessment district and finance seismic retrofits through increased property taxes. This is currently under consideration by some cities. State legislation on this issue is pending.	
Local Funds and Programs	Local Government Revenue Bonds	The state allows local governments to sell revenue bonds to fund low-cost loans to private owners for the seismic retrofit of URM buildings. Although technical corrections made last year (AB 810 by Costa) broadened the definitions of residential structures and essential services buildings and eligible costs, the Federal Tax Reform Act of 1986 prevents their use for refinancing existing debt. Tax-exempt bonds are limited in size by a State volume cap, which limits fund availability. Amendments pending in the Legislature would allow for lease purchase buy-back schemes.	Small proportion of the City's inventory applies. Only a small proportion of the work would be tax exempt. Little applicability in this case.
	Transient Occupancy Taxes, or Tax Increment Financing	Several local governments have considered using motel, hotel or other taxes to help finance seismic retrofits.	Available Funds commited.

Type of Program	Title	Definition	Applicability
Local Funds and Programs Cont.	Low-Interest Loans	These are loans to building owners from the City or County at interest rates at or below the normal market rates. Jurisdictions can fund a portion of a loan package through private lenders to reduce the effective interest rates.	Applicable. Potential source of limited funding. Any owner is eligible. Funds not currently available to cover all buildings. Would probably be restricted to Level III upgrades only.
	Grants	These involve direct payments to owners for a portion of the seismic work and are usually funded by the City. Typically, the costs permitted may be for engineering analysis or work on the facade, where it contributes to the safety of public thoroughfares.	Possibly applicable only to Redevelopment area and to areas where safety of public thoroughfares are involved. Potentially Block Grant funds could be used to a limited extent for this purpose in the future.
	Project Management Services	Some cities are considering providing project management services to building owners by pooling many seismic retrofit projects and hiring single design professionals and contractors in the hopes of achieving economy in scale.	Applicable. City willing to consider this type of program, especially within the Redevelopment Area.
	One-Stop Governmental Services	Buildings owners with seismic retrofit projects must often communicate with several different local government agencies. When confronted with a large number of building owners, some local governments have taken steps to streamline the application and approval process with one-stop governmental services.	Applicable but will not substantially reduce upgrade costs.
	Zoning Incentives	Existing planning and zoning ordinances can create disincentives for seismic retrofits by restricting or even preventing the change of use of buildings. Waivers of these disincentives can improve the feasibility of seismic retrofits by allowing more ways to finance the work.	Applicable. Proposed ordinance contains this language.
	Demolition and Reconstruction	Some jurisdictions allow for demolition of buildings and reconstruction of safer buildings with the same story height and size.	Applicable. Proposed ordinance contains this language.
	No Fee Permits	Reduce or eliminate fees for new construction.	Applicable. City willing to delete fees.

Redevelopment Agency Tax Increment Financing

If a property is located within a redevelopment project area, a redevelopment agency can use its tax increment money to loan to property owners for seismic upgrading. Currently, the City's Redevelopment Tax Increment Funds are entirely pledged to debt repayment. **For this reason, this source of funding is not likely to be a useful alternative in the near future.**

Housing Rehabilitation Programs

Buildings where at least 50 percent of the tenants are of low and moderate income may qualify for Block Grant funds for rehabilitation. A variety of Federal and State rehabilitation programs would potentially be applicable in mixed use or exclusively residential structures For many owners, rent increases will represent the most feasible financing option for seismic retrofitting. Large rent increases, however, will place a significant burden on tenants, especially low and moderate income residents. While the City cannot prevent owners from rent increases imposed by owners to help finance the cost of seismic retrofitting, the City should consider pursuing programs to ease the rent increase burden to residential tenants living in unreinforced buildings affected by the ordinance. **Only a small percentage of the total building stock subject to the ordinance would qualify for housing rehabilitation programs.**

Reduction in Building Permit Fees

To reduce the cost of seismic retrofitting to the owner, the City should consider eliminating (or at least reducing) the cost of building permit and plan checking fees. **Fee exemptions would only provide minor relief to property owners.**

Zoning Incentives

The City should consider eliminating or reducing costly land use requirements (compliance with parking requirements, etc.) in cases where major rehabilitation is proposed. This incentive may allow building owners to avoid demolishing their structures or evicting current business tenants if they are unable to meet current zoning requirements. **The "like for like" replacement provision in the ordinances previously proposed by the City should be retained in any revised version of the ordinance.**

Public Financing from State Sources

Proposition 77 bonds provide three percent loans for seismic rehabilitation, general rehabilitation, the purchase and rehabilitation of unreinforced rental units, and for refinancing an existing debt on an unreinforced residential building to lower income residential rents. The principal (and in some cases, the interest from these loans) are usually due at the end of the 20- to 30-year loan term. Access to these loans is contingent upon the income status of the residents who occupy the units (at least 70 percent must be low-income) and upon rent limitations set forth by the State. **Although very few of the buildings in the Ventura inventory covered by the ordinance requirements could qualify for these funds, some of the buildings excluded from meeting the proposed requirements could potentially be upgraded with this source of funds. Mixed use buildings are eligible for these loans.**

Marks Historic Bond Act

The Marks Historic Bond Act gives Cities and Counties the authority to provide low-interest, long-term loans to finance the rehabilitation of historical buildings through the issuance of revenue bonds. **By establishing a portion of the City as a Marks Historic Bond District, buildings in the Main Street Corridor would be made eligible for low-cost financing for seismic and general rehabilitation. This source of funding could potentially be used to upgrade the selection of historic buildings designated for upgrade (as recommended in Chapter 9).**

These funds can be used for seismic retrofit costs to upgrade only designated historic buildings (except commercial buildings). The funds are made available through a bond issuing authority created by a redevelopment agency. These bonds are basically tax-exempt industrial development bonds for historic buildings. Eligible buildings must be on a local, state or federal inventory of historic buildings. **Applicability of this source of funds to the City of Ventura inventory is relatively limited.**

Tax Credits for Historic Structures

Tax credits for rehabilitation are available under the 1986 Tax Act. Such credits provide for a 10% Investment Tax Credit (ITC) for buildings constructed prior to 1937 and a 20% ITC is available for certified historic preservation projects. Each of these credits has complexities that should be discussed with an individual owner's accountant to determine applicability. To be eligible for the historic building tax credits, the construction documents must be approved by the Stated Historic Preservation Office and the National Park Service.

Seismic Safety Loan Bond

Although this bond program was not approved by the voters in 1990, it is likely that a similar initiative or legislation will be passed in the future.

Other Proposed Legislation

As a result of the Loma Prieta Earthquake in October of 1989, the State Legislature was called into Extraordinary Session to discuss measures to provide immediate relief to affected areas and to discuss measures to reduce damage in future quakes. Several Senate bills related to low-cost financing and financial incentives for retrofitting unreinforced buildings were introduced. Bills of interest include Senator Torres' Tax Deduction Bill (SB25x), which may provide tax deductions for owners who rehabilitate unreinforced buildings and Senator Roberti's Housing and Homeless Bond Act of 1990 (SB8x), which will increase the current bond act from $150 million to $450 million and enable the rehabilitation of buildings identified as potentially hazardous. **The City should actively support and lobby for the passage of these bills. These pieces of legislation and similar programs will probably expand the funding base for rehabilitation in the coming decade.**

Private Financing

Banks and savings and loans are reluctant to provide either acquisition or rehabilitation financing for unreinforced buildings because lenders perceive (correctly) that seismic retrofitting does not necessarily enhance the income-generating capacity of a building and thus such upgrades do not justify added investment in construction that merely improves public safety. In addition, as discussed above, many unreinforced buildings are held on heavily mortgaged contracts of sale and other complex arrangements that develop when commercial paper is unavailable. Moreover, stricter than conventional underwriting criteria are usually established for unreinforced buildings which generally exclude all but a few such buildings from obtaining loans. Most institutions which do sometimes finance seismic rehabilitation, including thrift institutions, charge higher than normal interest rates, causing the total cost of rehabilitation to increase correspondingly.

One option the City may wish to pursue to influence the cost and terms of financing for seismic rehabilitation would be to develop a program, in conjunction with local financial lenders, which could potentially ease underwriting criteria and lower interest rates. If the City could provide some form of mortgage insurance through a bond program, then conventional lenders may be more willing to approve unreinforced building loan applications. While any joint government-banking industry program developed would potentially not offer low-interest loans at extremely favorable terms, such a program could potentially help some owners who are simply unable to obtain any type of financing for the required upgrades. Whether such a joint effort is feasible is questionable.

Property Tax Relief Program

The City could consider instituting a property tax relief program for owners of unreinforced masonry buildings. Such a program should be designed to minimize or eliminate local property tax payments equal to the cost of upgrading for any building owner who voluntarily strengthens a structure to Level III (or greater) standards. Revenue losses to the City would be substantial for a 10 to 20 year period necessary for crediting the cost of the upgrade. However, compared to other potential programs which involve administrative expenses, loan and grant programs, hours of coordination, and other staff commitments, a property tax relief system may ultimately be far less expensive to the City than creation of a loan program. The legality of such a property tax relief system should be explored before attempting to implement such an approach to the problem.

Local Loan Programs

State law has authorized establishing local loan programs for seismic rehabilitation, and the City has such flexibility under its Charter. A variety of options exist, but all are funded locally, usually out of General Fund monies or City Reserve Funds. Loan programs using local funds can be only for planning, engineering and design, or only for construction financing, or for the complete financing of seismic upgrading. The conditions and terms of such loan programs may be established locally.

Currently, the City has a commercial rehabilitation loan program. There is an uncommitted balance of approximately $800,000 remaining in this program which has been funded by the City out of reserve funds. The terms for these loans are 7% interest for a 10-year loan, or 5% interest for a five-year loan, with a $100,000 maximum loan amount for any single project. Based on the Council's action on December 12, 1988, these funds may only be used for commercial rehabilitation work that includes a Level II seismic upgrade.

Other local loan options are potentially available. State legislation in 1982 authorizing local bond financing programs required a city to make one of the following findings in making a loan: (1) the owner to whom financing would be made available is unable to qualify for or could not afford financing for eligible costs from private lending institutions; (2) absent the availability of financing, the eligible building would be demolished; (3) absent the availability of financing, the cost of modifying the building would cause severe economic hardship to the businesses in the building. The City could establish a new loan program based on these lending criteria for Level I upgrades on a relatively short-term payback basis (say five to ten years), provided the City was able to match the interest rate it currently receives from investing reserve monies, plus 2% to account for the risk factor for buildings that are not reinforced to a Level II standard. For example, as a part of the future budget process, the City could allocate money to a new local loan program, separate from the existing commercial rehabilitation loan program, that would allow for short-term lending of City reserve monies at a competitive interest rate for Level I work, provided that for each loan the criteria outlined above were met.

Bond Programs

There are essentially two types of bond programs available based on the criteria established by the Federal 1986 Tax Act. Bond programs would require the "pooling" of several different property ownerships who want to upgrade all at one time in order to make the bond issue of a size sufficient to warrant issuance costs. At a minimum, bond issues should be about $2,000,000 in size, with the best threshold being close to at least $5,000,000. Under any local bond program, the City would serve as an issuer and then would loan funds to private owners. The securities for the loan repayments would be mortgage liens on the properties involved. The discussion which follows regarding creation of a Special Assessment District is, in essence, one way of using bond programs to fund retrofits.

Public Purpose Bonds

Public Purpose Bonds are tax-exempt bonds issued by a city. Up to 5% of a total bond issue may be used for financing unrelated private activities by way of consumer loans. Seismic retrofit costs could be considered such a loan. To qualify for tax-exempt status, however, 95% of the bond issue must be used for public purposes (i.e., for activities or properties that are currently and would remain public).

Private Purpose Bonds

These bonds are permitted under Federal 1986 Tax Act but would be taxable. While issued at taxable interest rates, there could potentially be some cost savings to owners if there is a sufficient pool of owners who wish to upgrade at once.

General Obligation Bonds

General Obligation Bonds can be issued for seismic retrofit purposes, subject to a 2/3 approval of the voters. Such bonds must be carefully crafted to obtain voter approval.

Creation of a Special Assessment District for Seismic Rehabilitation

Several cities in southern California (e.g., Ojai, Torrance and Long Beach) have established Special Assessment Districts to generate the funds necessary to pay for City mandated seismic upgrade programs. An Assessment District is formed to provide a mechanism for levying assessments on private property. There are several types of assessment districts but typically the majority of the property owners who control the majority of the assessed valuation within the proposed district must comment to its formation. One formed, the City issues taxable bonds for sale to the public. Funds raised in this manner, together with minor contributions from assessed properties, are then made available to any property owner in the District to fund a limited and designated activity--in this case, seismic retrofitting. The assessment becomes a lien against the properties with precedence over all other liens.

For owners that cannot obtain financing for a mandatory retrofit, such a procedure is possibly the only assured means of obtaining the required funds. Interest rates associated with loaned funds are generally at or near market rate (though not in excess of the rate). Creation of a District is not recommended unless the value of the retrofits exceeds at least $3 million dollars. The City of Ventura situation clearly satisfies this condition. Approximately $50,000 in legal fees to a firm specializing in Assessment District creation would be required to establish the District.

Recommendations for Implementing Funding Programs

There are obviously many strategies available for funding the required upgrades. The assistance of the City (in some form) will undoubtedly be required for a substantial number of unreinforced buildings. To implement a funding program, the consultant recommends that the City determine which programs or approaches are preferred. Once this is done, the City should assemble a financing plan that makes some programs available to all owners and specific programs available to a more limited range of owners. The City should not consider substantial involvement in upgrades that are not oriented to a **Level III** degree of reinforcement. However, property tax relief, small grants, building permit fee reductions, and other forms of financial offsetting could be provided for those properties upgraded to less stringent standards.

In addition, the City should review the inventory of buildings and determine which structures would qualify for commercial rehabilitation loans and other programs with narrow scope and focus.

It would be desirable to have at least some form of assured City participation in place prior to finalization of the of any ordinance.

12.9 Cumulative Effects and Summary of Recommended Mitigation Measures

Cumulative Effects

If the recommended ordinance approach is adopted (or some variation on this proposal) project impacts throughout the City are anticipated to be very minor. Construction and cultural resource impacts, the only potentially substantial physical effects that may result from adoption of an ordinance, would only be noticeable in the Main Street corridor and mitigation measures, summarized below, have been conceived to offset these impacts to insignificant levels. Since project specific effects would be mitigated to less than significant levels, no cumulative effects are anticipated. **Many of these mitigation measures would become unnecessary if the environmentally superior option is adopted. However, since ultimately a Level III standard will be adopted into the building code and because some building owners would be required to comply with a Level III upgrade in the future (with a major change of use or other requirements identified in the Uniform Building Code), these mitigation measures should be considered for adoption on a case by case basis.**

Potentially significant cumulative traffic, air quality, and other related impacts for the Downtown Community and Redevelopment Area are described very completely in the Redevelopment Plan Amendment EIR that was certified in 1990. This document contains a thorough assessment of cumulative traffic, air quality, cultural resource and construction effects in the Main Street corridor vicinity. The findings in this EIR indicated that a series of phased improvements, Transportation Demand Management programs, payment of air quality fees in accord with revised APCD guidelines, and other programmatic measures can effectively address cumulative problems in this part of the community. **Cumulative mitigation measures contained in the Redevelopment Plan Amendment EIR include recommendations to monitor conditions in the Downtown Community and Redevelopment Area to prevent adverse effects associated with traffic circulation and public service effects. Since the proposed unreinforced masonry ordinance program recommended by the consultant is designed to retain the majority of existing unreinforced buildings, no major land use changes are anticipated that would result in major changes to existing conditions in the Downtown Community. Cumulative effects are not anticipated to be significant.**

Summary of Mitigation Recommendations

Regardless of which of the many options considered in this EIR are adopted, some relatively minor adverse physical effects associated with construction and impacts to cultural resources are anticipated. However, depending on the level of upgrade selected, these impacts are anticipated to be quite minor, especially if construction is phased over a five or six year time frame. From the standpoint of cumulative effects, impacts resulting from construction, effects on community aesthetics, streetscape appearance, and cultural resources, would be fully offset by the implementation of mitigation measures recommended in the EIR. Therefore, regardless of the type of ordinance option that is ultimately selected, the following mitigation measures, to the degree relevant to the ultimately adopted program, are recommended to reduce project specific and cumulative effects to insignificance.

CEQA Mitigation and Monitoring Requirements

AB 3180 (Stats 1988, ch. 1232) which became effective on January 1989 [codified as Public Resources Code Section 21081.6] now requires that, along with the adoption of the findings specified in an EIR, the lead agency also must adopt a "monitoring/reporting program" to "ensure compliance during project implementation." The following reporting/monitoring program is recommended by the consultant to specify timing and personnel responsible for monitoring the implementation of the mitigation measures recommended in this EIR.

Cultural Resource Mitigation Measures

To reduce impacts on cultural and visual resources to insignificance, the following mitigation measures are recommended:

Mitigation Measure

(1) **The City Historic Preservation Commission, based on the advice of the Building Official, shall prioritize designated City Landmarks and Structures of Merit as the building stock of historic structures to be preserved in the event of a moderate to strong earthquake. Engineering studies shall be performed on these structures (by the building owners with the assistance and cooperation of the City) to determine what modifications are necessary to enable the structures to withstand either the maximum credible earthquake for Ventura or an appropriate design quake selected by the City. The final protective design for these structures shall consider both the interior and exterior visual effects of various strengthening activities on the historic integrity of the buildings. The basic design objective should be oriented towards preserving the historic integrity of the streetscape facades of these buildings rather than historic building interiors.**

Implementation Responsibility and Funding

The City Building Official would be responsible for convening the Commission and obtaining their recommendations. Once prioritized, the City Building Official in consultation with the Community Development Director would develop a program to implement upgrades on selected structures. An engineering report would be obtained (depending on the availability of funds) describing the scope of upgrade required for each individual building. This cost of this report would probably partially be defrayed by participation of the building owner. Implementation of the recommended upgrades would be performed as funding is made available through Federal, State, or local support programs.

Reporting/monitoring of this mitigation measure would be a long term on-going activity that should be coordinated by the City Building and Safety Division. The duration of the program would depend on how the City chooses to implement this recommendation.

Timing

The selection of the list of buildings to be preserved could be completed relatively quickly. Obtaining engineering reports would require about two months.

Monitoring Division

Building and Safety Division, Community Development Director, and Planning Division

Standards for Success

Partial compliance with the measure will be achieved once design standards are set and once the City's Historic Preservation Commission decides what historic buildings should be subject to the standards. Full compliance would be achieved with the completion of engineering reports.

Mitigation Measure

(2) **All strengthening work on buildings of historic significance shall be performed in accord with a set of standards developed by the City to restore the exterior visual quality and detailing of these buildings. These standards shall address:**

- **building detailing,**
- **brick repointing,**
- **restoration of stone elements,**
- **painting guidelines (brick painting shall be prohibited),**
- **use of historic wall anchor styles,**
- **signage and awnings,**
- **removal of stucco (unless such a surface was present on the original building)**
- **other features determined significant by the Historic Preservation Commission.**

Implementation Responsibility and Funding

Reporting/monitoring of this mitigation measure would be an ongoing activity that should be coordinated by the City Building and Safety Division and implemented through review by the City's Architectural Review Board and Historic Preservation Commission. This review body and the City's Historic Preservation Commission should work with the City Building and Safety Division to define and publish applicable standards. The City would fund the definition of standards and building owners would pay for building specific construction work.

Timing

The definition of standards should occur through the process of public hearings on a set of City developed draft standards. Final standards would be adopted after public hearings and a full consideration of the standards by the Historic Preservation Commission and the Architectural Review Board.

Monitoring Division

Building and Safety Division and Planning Division staff. Once these standards are published, the responsibility for compliance would be with the applicants subject to building permit review procedures.

Standards for Success

Publication of applicable standards.

Mitigation Measure

(3) **With the cooperation of property owners, the City shall establish an Historic District encompassing the boundary of all unreinforced masonry structures included in the Main Street Corridor. This district should be created to assist in designing and funding a comprehensive, unified solution to strengthening within this corridor. The District should be organized to utilize Marks Historic Bond Act funds, Mills Acts Contracts, and other resources to assist in upgrade efforts. Individual property owners should be required to pay a fair share of any future reconstruction activities within this corridor if a formal Assessment District is established to complement the Historic District Designation. At a minimum, properties within the proposed District should be afforded the opportunity to participate in Mills Contract programs to help defray the costs of upgrading.**

Implementation Responsibility and Funding

Implementation of this measure should occur prior to the need for any work being performed as a result of any higher standard upgrade mandate for historically significant buildings. Coordination activities would be required until full compliance is achieved with recommended upgrade standards. A specialist on the City staff familiar with the broad range of applicable historic preservation programs should be assigned the coordination effort to expedite City assistance in achieving compliance with adopted upgrade standards.

Public hearings should be held to consider the advantages and disadvantages of creating an historic district within the area where the City's unreinforced structures are concentrated. Establishment of either a district of procedure for determining the applicability of Mills Act contracts should also be established through public hearings. The City should retain a consultant familiar with the Act and its implementation to assist in developing a program for the City. The costs of establishing a district would be the responsibility of the City.

Timing

Once an ordinance is adopted and if establishment of a district is determined to be feasible and advantageous, then implementation would occur within about a year.

Monitoring Division

Building and Safety Division and Planning Division

Standards for Success

Reporting/monitoring of this mitigation measure would be an ongoing activity that should be coordinated by the City's Community Development Department.

Construction Effects

To reduce impacts from construction, the following mitigation measures are recommended:

Issue 1: Asbestos Remediation

Mitigation Measure

(1) **If deemed warranted and at the City Building Official's discretion, prior to issuance of building permits for strengthening or demolition permits for building removal, an asbestos evaluation shall be performed by a qualified consultant to determine what asbestos is present and how the hazard is to be remedied. All asbestos remediation and disposal shall be performed in accordance with Federal, State, and City guidelines and policy.**

Implementation Responsibility and Funding

Reporting/monitoring of this mitigation measure would be an on-going activity that should be coordinated by the City Building and Safety Division. Compliance with the measure will be achieved on a case by case basis and only in cases where such remediation is determined to be necessary by the City Building Official. The City Building Official would be responsible for implementing this measure. Funding of inspection and remediation would be paid for by building owners.

Timing

Inspection and remediation would occur prior to reinforcement.

Monitoring Division

Building and Safety Division

Standards for Success

Identification and removal of asbestos as necessary on a case by case basis.

Issue 2: Noise Inconvenience

Mitigation Measure

(2) **To minimize noise effects, all stationary construction noise sources should be sheltered or enclosed to minimize effects. When feasible, generators and pneumatic compressors shall be placed in parking areas or behind buildings outside of public and business pedestrian traffic corridors. Flexible work hours (including evening and weekend construction) should be permitted only if nearby residential areas can be protected from noise sources. All construction shall comply with the City's Noise Ordinance.**

Implementation Responsibility and Funding

Reporting/monitoring of this mitigation measure would be an on-going activity that should be coordinated by the City Building and Safety Division. Compliance with this measure will be achieved through staff review of field conditions on a case by case basis.

Timing

In-place noise reduction barriers should be installed at the outset of construction. Other measures should be used on an as needed basis during the construction period.

Monitoring Division

Building and Safety Division

Standards for Success

Best available technology should be used to reduce noise levels to the extent feasible. Conformance with noise reduction standards would be evaluated on a case by case basis by Building and Safety staff.

Issue 3: Dumpsters, Dust, Odors and Other Minor Inconveniences

Mitigation Measure

(3) **All contractors involved in building strengthening shall provide a written dust suppression strategy to be submitted with building permit applications. Dumpsters, pre-assembly construction tasks, and materials storage shall be limited to defined, proscribed areas. Their materials storage and work areas shall be situated, to the degree feasible, behind rather than in front of buildings where upgrades are being done, or in parking lots adjacent to construction locations. Construction schedules shall be made available to adjacent building tenants. Dust covers and temporary building sheathing as well as other dust suppression methods shall be used when appropriate. Construction activities shall be coordinated with tenants and, to the degree physically feasible, the concerns of tenants shall be taken into consideration in conditioning all seismic upgrades.**

Implementation Responsibility and Funding

Reporting/monitoring of this mitigation measure would be an on-going activity that should be coordinated by the City Building and Safety Division. Compliance with this measure will be achieved through staff review of field conditions on a case by case basis. The City should not issue building permits until a written dust suppression plan is submitted. The plan should identify the location of dumpsters, materials storage, signage for pedestrians, and should include a preliminary construction schedule and evidence of consultation with tenants. The costs associated with dust suppression should be included in the upgrade contract between the owner and the contractor performing the work.

Timing

The plan should be submitted prior to issuance of building permits.

Monitoring Division

Building and Safety Division

Standards for Success

The field verification documenting plan implementation would be the responsible of the Building Inspector assigned to monitor the upgrade.

Issue 4: The Duration and Organization of Construction

Mitigation Measure

(4) **If a Level III program is adopted, to minimize construction effects on the public, owners, tenants, and essential fire and police services providers, the City shall be partitioned into upgrade districts. Construction within the Downtown corridor should, to the extent feasible (unless a building owner decides to pursue a strengthening program prior to scheduled completion dates specified in the ordinance), occur only during the specified time frame in the ordinance. These districts should be approximately one block long in size and construction should be sequenced taking into account the economic viability of businesses within each block. A district program would probably not be warranted if a Level I or II program is adopted.**

Implementation Responsibility and Funding

This measure would be implemented only if a **Level III** standard is adopted. Details of implementation carried out in other cities with similar programs (e.g., Santa Barbara, Santa Monica) should be studied by City staff and modified as necessary for implementation in Ventura. Construction sequencing should have no additional cost consequences (above the standard **Level III** upgrade costs). If such a partitioning of the City is determined to be a feasible measure for construction impact mitigation, the use of construction districts should be specified in the timing and implementation section of the ordinance.

Timing

An implementation plan for block by block construction phasing should be developed immediately upon adoption of an ordinance (if the **Level III** standard is adopted).

Monitoring Division

Building and Safety Division and Planning Division

Standards for Success

Reporting/monitoring of this mitigation measure would be an ongoing activity that should be coordinated by the City Community Development Department. Coordination activities would be required until full compliance is achieved with recommended upgrade standards.

Issue 5: Construction Effects on Business Tenants

Mitigation Measure

(5) **To minimize construction effects on tenants, the City should appoint an upgrading liaison representative who would be responsible for implementing and monitoring compliance with a program to minimize construction effects on tenants. This program should be responsive to building tenants needs. Tenant participation in defining the scope of this program should be encouraged. Recommended components of the program include:**

- **if feasible and implementable, providing a system of fines or penalties for the contractors if the construction goes on longer than planned; this system of penalties would not involve the City directly but could take the form of a liquidated damages clause between owners and contractors;**

- **the City should provide a construction liaison to coordinate complaints and to advise owners, tenants, and contractors about the need for consultation in construction scheduling between the tenant, the building owner, and the contractor;**

- **a streamlined process for approving plan modifications should be established to minimize disruptions in buildings where plan changes are necessary;**

- **prior to initiation of construction, a schedule of activities should be drawn up and the tenant and contractor should coordinate regularly regarding planned activities;**

- **when physically and economically feasible, dumpsters should only be permitted out of the flow of business and pedestrian traffic (either to the rear or on the side of building not exposed to pedestrian movements);**

- **a pre-construction conference should be held between the contractor, the tenant, and the workers actually performing the upgrading; and**

- **all construction barriers should be planned to keep the building entrance and signage visible.**

Implementation Responsibility and Funding

This mitigation measure essentially establishes a monitoring program to assure that tenant effects would be minimized. Such a program should be implemented under the guidance of the Community Development Department. Tenant participation should be encouraged by conducting a public hearing on construction planning and obtaining input from property owners about how best to effectively implement these measures. Implementation of other components of the proposed measure would be the responsibility of the City Building Official and Building Department Inspection staff. The feasibility of establishing a system of fines for non-compliance may not be feasible. Streamlining plan changes and providing a construction liaison individual would be City responsibilities.

Timing

A program to implement these measures should be developed once an ordinance is adopted. The scale and content of the program is dependent upon the type of upgrade required by the ordinance.

Monitoring Division

Building and Safety Division and Planning Division

Standards for Success

These standards should be defined once the details of the program are determined.

Residual effects associated with implementation of an ordinance are anticipated to be non significant.

CHAPTER 13

OTHER CEQA SECTIONS

13.1 The Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

As discussed in prior chapters, the various strengthening programs considered in the EIR (**Level I through Level IV**) provide increasing long term life safety benefits and would also tend to reduce long term future expected earthquake damage to unreinforced buildings resulting in lesser repair costs and fewer buildings with damage sufficient to warrant demolition after earthquake events. Therefore, housing units, businesses, and other uses in unreinforced buildings would ultimately be conserved under these alternatives. These life safety and building conservation benefits would occur at the expense of some shorter term environmental impacts including: some relatively minor cumulative displacement of existing residents and businesses in buildings that are demolished rather than upgraded, short term construction effects and some longer-term economic impacts of retrofit costs. Given the mitigation measures proposed in the EIR, the potential loss of buildings of architectural and/or historic merit due to retrofit costs is anticipated to be minor as are construction-related dust and noise affecting building occupants.

An unreinforced building upgrade program would result in these short term impacts which would be balanced against the long term benefit of rehabilitation, increased safety to occupants and passersby, and increased longevity of this aging building stock.

Adoption of an upgrade program would be justified now, rather than reserving an option for future alternatives, because of the immediate earthquake hazard as evidenced by increasing seismicity in the Southern California region and the Loma Prieta earthquake of 1989. The options being considered reflect current knowledge of how to strengthen older buildings. There are no apparent pending technical breakthroughs in reinforcement design that would achieve the project objectives without associated impacts.

13.2 Significant Irreversible Environmental Changes Which Would Result from Implementation of the Proposed Ordinance

None of the alternatives would generate significant land use changes utilizing significant amounts of non-renewable resources. Construction materials needed for retrofit work are available in the amounts which would be required.

The "no project" option would lead to the most casualties, building damage and losses, and disruption in the event of earthquakes. Implementation of **Level I, II, or III** alternatives would, in order of magnitude, result in increasingly fewer potential earthquake casualties, a reduction in building damage and losses, and reduction of future social and economic disruptions due to earthquakes. Some degree of earthquake casualties, building damage, and disruption would occur under any of the alternatives. It is not possible to establish a firm threshold of human life losses which can be generally agreed upon as "significant" or "not significant". Furthermore, the magnitude of these and other program effects depends in large part upon the program timeframes and priority schemes chosen.

CHAPTER 14

COMMENTS AND RESPONSES

The draft EIR was published on March 22, 1991 and the forty-five day review period for the document concluded on May 14, 1991. During this time period, comments were received from State agencies, County agencies, one City within Ventura County, members of local interest groups, unreinforced masonry building owners, and other members of the public without a financial interest in the buildings that are the subject of the proposed ordinance.

After reviewing all of the comments received, the City directed the consultant to respond to all comments and prepare the Final EIR. A number of minor changes were made to the text and additional supporting data were included in the Final document concerning the seismicity of Ventura, the potential of liquefaction in the Downtown area, the economic effects of the proposed ordinance, and other topics. Comments were received from the following individuals, agencies, and groups:

I. Minutes of the Environmental Impact Report Review Committee

(1) Andrew Chakires
(2) James Prosser
(3) Joseph Puopolo
(4) John Hibbs
(5) Marcum Patrick
(6) Ray Russum
(7) Thomas Wood
(8) Helen Elardo
(9) William Chilcutt
(10) Virginia Gould
(11) Mark Evans
(12) Malcolm Cornett
(13) Bambi Ruebe
(14) William Kallunsky
(15) Mr. Lefcourt

II. Comments Provided by Cities within Ventura County

City of Ojai, Andrew S. Belknap letter dated April 30, 1991

Howard F. Stup & Associates, letter dated April 18, 1991

III. Local and State Agency Comments

County of Ventura Resource Management Agency Transmittal letter dated May 13, 1991

County of Ventura Sheriff's Office, Jan Smith letter dated May 3, 1991

Ventura County Regional Sanitation District, William S. Chiat letter dated May 13, 1991

Southern California Association of Governments, letter dated May 2, 1991

California Coastal Commission, letter dated April 18, 1991

Governor's Office of Planning and Research, letter dated May 9, 1991

IV. Building Owners and Members of the Public

Committee to Preserve Historic Ventura, letter dated May 13, 1991

Harry R. Hibbs, letter dated April 30, 1991

Harry R. Hibbs, letter dated May 13, 1991

Helen J. Elardo, letter dated May 14, 1991

John W. Hibbs, letter dated May 14, 1991

Virginia Gould, letter dated May 10, 1991

Thomas Wood, Ventura Realty, letter dated May 13, 1991

Andrew Chakires, letter dated May 8, 1991

Andrew Chakires, letter dated May 14, 1991

For ease of reference, comments and responses have been organized in the following manner: following this introduction, comments received are presented on the left half of the page and correlative responses by the consultants are provided on the right. If a comment is editorial, not germane to the adequacy of the EIR, or reiterates the conclusions presented in the document, no responses are provided. Responses have been provided to each relevant comment. Responses have also been provided to the comments recorded in the minutes of the Environmental Impact Report Review Committee. These responses preceed the written comments and are organized by the name of each person providing oral comments.

I. Minutes of the Environmental Impact Report Review Committee

On the following pages, minutes of the EIR Review Committe are provided with marginal number references corresponding to the responses provided following the minutes. Responses are provided to oral comments recorded in the minutes which were provided by:

(1) Andrew Chakires

(2) James Prosser

(3) Joseph Puopolo

(4) John Hibbs

(5) Marcum Patrick

(6) Ray Russum

(7) Thomas Wood

(8) Helen Elardo

(9) William Chilcutt

(10) Virginia Gould

(11) Mark Evans

(12) Malcolm Cornett

(13) Bambi Ruebe

(14) William Kallunsky

(15) Mr. Lefcourt

ENVIRONMENTAL IMPACT REPORT COMMITTEE

MAY 9, 1991

The Environmental Impact Report Committee met on Thursday, May 9, 1991 at 2:00 p.m. in the Community Meeting Room of City Hall, 501 Poli Street, Ventura, CA.

COMMITTEE MEMBERS PRESENT:	Everett Millais Director of Community Development
	Shelley F. Jones Director of Public Works
	Steve Chase Environmental Coordinator City Manager's Office
STAFF PRESENT:	Peggy Woods, Assistant Planner Mark Stephens, Senior Planner Bob Prodoehl, Building & Safety Jim Neuerburg, Deputy City Attorney Don Marquardt, Landscape Architect Phil Johnson, Assistant Planner

The meeting was called to order at 2:00 p.m. by the Chairman.

A. ORAL COMMUNICATIONS

There being no one wishing to be heard, the oral communications were closed.

B. ENVIRONMENTAL ASSESSMENTS

1. IN RE EIR-1468 - CITY OF VENTURA - PUBLIC HEARING ON DRAFT EIR-1468 FOR AN UNREINFORCED MASONRY ORDINANCE. THE PROJECT INCLUDES A RANGE OF EIGHT ORDINANCE OPTIONS THAT WOULD BE APPLICABLE CITY-WIDE AND WOULD AFFECT APPROXIMATELY 138 POTENTIALLY HAZARDOUS BUILDINGS.

The Chairman stated that written comments will be received by the City until 4/14/91. No decision will be made this afternoon on the draft EIR. The final document and response to the comments will return 8/1/91 for the Committee's review.

Andy Chakires, P.O. Box 566, 371 Poli Street, Ventura, CA 93002, is a co-owner of an unreinforced masonry building. He questioned whether the City was in technical compliance at the present time with the State law. He requested a delay for additional public input because this is a complex subject. He pointed out there is no adequate index or glossary and there are a number of citations that are inadequate, as well as a number of issues not addressed.

He asked for an additional 90 days to study this and give it some thorough thought.

He thought there was a safety issue. Contrary to the belief that this will save lives and protect buildings, he believes just the opposite. It is likely to kill more people and destroy more buildings than an earthquake would. He submitted a report by Rutherford and Chekene dated July, 1990, which shows that retrofitting is ineffective and of no help in an earthquake. It also states that non-strengthened unreinforced masonry buildings (URM's) out perform URM's. He referred to the table on page 21 of the draft environmental impact report.

He took exception to the various statements in the EIR saying it is unnecessary to read the whole report; all you need to do is follow the conclusions. A great deal of selected evidence is presented. But he did not have time to go into this, which is why he is asking for an extension.

In general, the problem is one of risk. The article in the Star Free Press said there are no solutions to risk, only trade-offs. He asked on behalf of everyone in Ventura that efforts be made to better specify the risks. He suggested contacting actuaries or statisticians to estimate the risk from the Loma Prieta Fault. He asked that this be added to the environmental assessment and dealt with proportionately.

Jim Prosser, representing the J. & E. Prosser Trust, Ventura that owns the unreinforced masonry building on Ventura Avenue and Fix Way, Ventura. He said he will submit written comments also.

He stated that the Appendix refers to 159 Ventura Avenue as being used for auto repairs. This is wrong and it is strictly storage. There is no auto repair going on there. Specifically with regard to 159 Ventura Avenue, it is an L-shaped building. There were other inconsistencies with the parcel lines.

The first policy issue concerns over-reliance on the Rutherford Chekene report. Mr. Prosser has experience with the seismic risk modeling, which is subject to a lot of opinion and is predominantly a math model. Also he did not know how a curve was drawn with only two items being considered.

The biggest problem with the draft EIR is the consultant's findings which are discussed in Chapter 7. He asked why it is outside the scope of the report and CEQA requirements to examine the actual cost if the ordinance is enacted? Referring to Chart 7-4, he asked why the consultant could not examine the effect of

the demolition of these buildings, how many people will be effected by the demolition, and the number of people dislocated because of it? Isn't that relevant the same as if an earthquake happened and the people were dislocated?

He attended the workshops, where many references were made to Santa Monica and their ordinance. In looking at the other cities, he suggested that the Ordinance should not be considered by itself, but the community as a whole. Santa Monica has a very aggressive downtown development corporation. Ten years ago it was worse than Downtown Ventura now. They turned it around.

In closing, he said the City can require whatever they want, but if the property owners cannot afford it, the City will end up with empty buildings. If there isn't an ordinance and we have an earthquake, people may be hurt. If the City passes an ordinance, it may kill the city, but it will certainly hurt the Downtown.

He asked the City to consider other economic considerations and on that basis draw comparisons and determine what level of support is necessary for the building owners. The need to bring up the level of sales, as well as the need to bring more people to the Downtown area should be considered.

Joseph Puopolo, 704 Elko Avenue, Ventura, CA 93001, owner of the Classic Furniture Gallery in Ventura, said he agreed with Mr. Prosser's comments. He asked if the City was going to help the property owners, if the ordinance is approved, with financing the reconstruction? The City is having a problem raising money, so they should be able to imagine what problems the property owners are having. Will the property owners be required to do all the buildings at once or what?

E. Millais said that the City did not have answers to these questions as yet. The intent is that there would be some financial assistance. The amount of time for completion of the retrofitting has not yet been determined. The work could be done block by block or on an individual timeframe yet to be determined. No ordinance has been drafted at this point. He informed the property owners that limited funds are available through the Revitalization Office for upgrading Downtown structures.

John W. Hibbs, 4300 Via Marisol, #788, Los Angeles, CA 90042, stated he had performed work for a number of property owners in the City and they have formed a citizens group to consider their position with regard to the proposed ordinance. They submitted a

letter dated 4/30/91 with a list of comments regarding deficiencies in the environmental impact report.

The issues he would like the committee to address are that there seems to be a lack of purpose. Is the purpose to deal with personal injuries and personal safety in the event of an earthquake? If so, is the report consistent in terms of what is the real chance of death or injury, especially in comparison with other areas of concern in the City, such as deaths from fires, drownings, etc? He thought it would be fairly simple to put these figures on a graph. It should be plainly stated what the risk of death is.

Regarding the economics, there is nothing that says how much money each building owner can afford. These building owners can only afford a certain amount in terms of rent from the building or property value. Then those are the numbers that we have to work with. If it is determined the building is worth only $100,000 then that is all we have to spend. Then these figures should be consolidated and decided what retrofitting can be done for $100,000 or whatever the figure turns out to be. If this were done, then the property owners should be able to go forward. There is no discussion of what we could get or what they could afford.

The evidence is not on the number of cities that strengthen the structures and how many people are killed as opposed to ones that are unreinforced. He would hope that this Committee in the final report will carefully consider written documentation and ask how it can be incorporated into the consultant's report.

S. Craig, asked if the property owners would be interested in providing economic information necessary to determine appropriate costs for these buildings?

Mr. Hibbs stated that in his opinion, the first step would be to eliminate the separatist attitude and think of the project as something all of "us" will accomplish. The community resources are at stake and whatever the costs are, they will be passed on to the consumer. He would be willing to provide the financial information.

S. Craig noted there was a lack of information about the economics for individual buildings. The willingness of the community to provide this information will enable him to arrive at the owner's burden ratio for the building. He was pleased to hear the property owners are interested in working with the City in this regard.

Mr. Hibbs said the Committee may not like the figures.

S. Chase said it did not matter if they liked the figures or not. It was important that the information be provided so it can be considered.

Mr. Hibbs asked if with regard to the personal safety issue the City could ask other agencies for figures on fire deaths, accidents, crimes, and drownings to compare these figures with the estimates. If it is a personal safety issue, then he would prefer to deal with it as such.

Marcum Patrick, 50 N. Oak Street, Ventura, a URM property owner, said that before the EIR is certified, many things should be addressed. One is the financing available to the property owners. He is not convinced that there is funding available. He can't find lenders willing to loan against the URM buildings. Seems the City is considering issuing a notice of potential hazard on each building that is a URM. This would motivate the property owners to get retrofitted. However, it seems unlikely the banks will lend money on this. The EIR should address this problem.

It was originally stated that the purpose of the ordinance was to ease the burden on the property owners. This is not exactly discussed in the EIR. He would like another opportunity to see the EIR and address the issues before it is certified. He would also like the opportunity to meet with the committee that is trying to preserve the historic Downtown area. He suggested that perhaps the City has relied too much on the Ventura Downtown Association comments, and the majority of members in that group do not own URM buildings.

He also was concerned about the lack of contact with actuaries through insurance companies to quantify the risks.

He purchased his building in January, 1990. He has not previously attended any meetings that led up to this EIR. However, he was concerned about the cost of the EIR and he would like to know how much the City spent on it.

In closing, he said the biggest concern should be easing the burden on the property owners. If the EIR is certified at the end of the public comment period, will the City Council decide what sort of ordinance they want and that will be the end of it? Or will the public have something to say about it?

S. Craig stated that the preparation of the EIR cost $80,000. Approximately $25,000 to $28,000 was spent on the risk model. It has taken almost two years to prepare with several engineers contributing to the effort.

Mr. Patrick said he thought more time was needed to review the EIR, and he thought the 90 days previously mentioned was reasonable. He did not have time to read the EIR and would like more time. He thought it would be fair to say that at least 50 percent of the URM property owners had not even looked at the EIR.

Thomas J. Wood, Ventura Realty Company, 67 S. California Street, Ventura, CA 93001, had a question with respect to the notice for the public meeting. He asked if notices were sent to everyone who requested it? Also he asked if the tenants of the URM buildings were notified?

He also thought an extension of time to consider the EIR was warranted. He did not think 45 days was an adequate review period for such a complex document. If the risk is so relevant, it should be examined more closely before just accepting the report.

Regarding the economics, the Committee should consider that there will be rent increases as a result of this Ordinance. However, a number of the property owners will be saddled with long-term leases. Because they will be spending money on upgrades, it would be in the best interest of the property owners to get rid of the current tenants and find new ones to pay higher rent. He was not sure how the City might protect the tenants in these circumstances.

He had some questions regarding Table 12-2. He suggested the model has not been put to much rigorous testing. The numbers apply to only a cluster of buildings plus the two outlying buildings and they seem high. He also referred to a letter in the technical summary dealing with the "liabilities of cities" issue and noted this should be clarified.

M. Stephens informed Mr. Wood that notices of the public hearing were not sent to all the tenants in the URM buildings. Mr. Wood thought that given the subject matter, they probably should have been notified and afforded an opportunity to participate.

Ray Russum, 2948 Sailor Avenue, Ventura, said he was an interested party. He asked for more time and thought this was a reasonable request. The property owners seemed to be trying to get enough information that will aid them and the City in coming up with a decision that will be beneficial to everyone. He understood only 40 percent of the buildings in the Downtown area were URM but that could definitely affect the economy of every building and the City.

He would like to use an acronym, REM, to signify a Reinforced Masonry Building. If the cost is too high for a REM, the City will have an empty building because the owner is priced out of business. The price will drive the current tenants out and Ventura will be a ghost town. The decision affects all citizens of the City. And he thought it was a reasonable request to give them another six months. He asked who makes the decision about a continuance?

S. Chase stated the Committee will consider that issue today. He understood a separate request was made to the City Council also.

Helen J. Elardo, 2341 Lexington Drive, Ventura, owns three URM properties. She read the whole EIR report, and would like more time to consider all the information presented. She suggested perhaps it would be appropriate to prepare a specific EIR on the Prieta Fault, which is a low priority fault. The location of the faults in relation to the Downtown area and their priority should be considered.

She also wanted more time to consider the engineering. Is a buttress really the answer? One of the buildings, the Henshaw Building, is reported to be a 37,000 sq. ft. building, occupied by 186 people. The building was just appraised as a 23,000 sq. ft. building with three floors. The statistics in the report seem skewed. She thought the property owners should be given the opportunity to review the data for accuracy with regard to their buildings.

She noted that the property owners and tenants were experiencing a severe economic hardship. They want to work with the City. They have to live with the safety of these buildings and it is very important to them. Please give them more time because they would like to work something out that is doable.

S. Craig, asked if she would be willing to provide economic data regarding the buildings she owns and Ms. Elardo said she would be happy to do so. She stated the last time her buildings were appraised, they were given a $158,000 discount for earthquake preparedness. She thought this should be considered also.

In closing she said the property owners needed more time and a plan for phasing. A more common consensus was needed as to the need for such an ordinance. The fact is that Downtown Ventura is not on an active earthquake fault. She thought there was ample opportunity for everyone to participate in the decision-making process.

Bill Chilcutt, 333 Mariposa Drive, Ventura, stated that many people could end up tearing down their buildings rather than retrofitting them. He asked if the City had considered retrofitting through the 600 block?

E. Millais said the City had not considered this but if the owners were willing, it would also be considered.

Mr. Chilcutt pointed out that most of the injuries during an earthquake come from falling parapet walls and glass. The majority of the problems occur when retrofitting at Level I rather than making up retrofits to Levels II or III.

Virginia Gould, 402 Lynn Drive, Ventura, was interested in this problem for sometime. She has done extensive research and read everything in the report. However, she believes the Committee should consider an extension, as the 650 page report is poorly organized. Nothing is footnoted or documented in the report, yet statements are made and conclusions drawn, which is not the way good research is presented.

The City is not in compliance with the URM law as far as daily occupancy is concerned. The average number of people in the building, the hours in the building, and so on must be considered. This is the only way to realistically evaluate the occupancy. She asked if the Fire Code occupancy figures were used? From whatever source the figures came, they appear unrealistic.

URM buildings have been billed as the greatest threat to human safety. If this is repeated often enough, everyone will soon believe it. There is no documentation to back up this statement. It never says in the report, as compared to what? What are the threats to Downtown in addition to earthquakes? The freeway bridges should also be considered, as demonstrated during the last large California earthquake in Northern California.

Statistics find the greatest threat and most dangerous buildings are public buildings. Not private buildings at all. Public buildings house many people, yet they are exempt from the URM law. It appears perhaps there are lots of buildings that should also be included in the ordinance. She did not think you could take only a handful of buildings compared to all the rest and say those were the ones in need of retrofitting. During the last earthquake in Southern California, Los Angeles College suggested the most damage of all the buildings affected.

Ms. Gould pointed out that some of the charts in the report were unreadable. She thought there was not enough data to explain how the conclusions in the report were reached. She asked for more time to consider all the data and make definite recommendations.

S. Craig asked if she would be willing to provide data on the buildings in the Downtown area and she said she would.

Mark Thomas Evans, 2223 Palomar Avenue, Ventura, said he was terrified by this whole process. He had been asking himself what will become of his life savings. He was very worried about how he could afford this.

His father was a geologist and could speak about faults with knowledge. When they moved to Ventura in 1954 it was thriving. About 1964 Ventura shut down the Downtown area because of a lack of modern wiring. Some businesses left Downtown Ventura and moved to the Esplanade and other shopping centers.

It appears that no one has ever died in Ventura because of an earthquake. However, it looks like the City is going to bankrupt his family because of this ordinance. The cost to retrofit the building will wipe them out. This concerns him and he is very worried about how he will be able to handle it. Even if they can get a loan, which is questionable, he does not know if he could handle it.

Malcolm W. Cornett, Ventura Moose Lodge, #1394, 10269 Telephone Road, Ventura, asked why he got a letter when most of the problems are in the Downtown area? They have an old building but it is on an 18 inch concrete foundation.

Bob Prodoehl stated this building was not on the original inventory list of URM buildings. However, when they inspected the building during a fire investigation, they discovered it had unreinforced masonry walls and it appears to be an old farm house.

Mr. Cornett stated it was constructed in 1929 and it was an old farm house.

Mr. Prodoehl stated they just happen to be the farthest URM building from the Downtown area.

Bambi Ruebe, 50 N. Oak, Ventura, found it difficult to accept the idea that the City was proposing to impose more government rules on URM buildings and expected the property owners to come up with money to make needed changes. She did not know many owners who could find the money to do this. The owners will end up leaving. Most of these people love their buildings. She can't imagine money being spent to install steel beams on buildings instead of restoration or maintenance, which might be just as good. The parapet walls and anchoring should be done first. Then she suggested that the emphasis should be placed on the restoration and maintenance of the URM buildings. That's what she would prefer. In-filling of concrete might strengthen the buildings, but this could be performed as general maintenance.

She liked the architecture and craftsmanship of the buildings and the craftsmanship is not available today to redo the buildings. She would hate to see them all torn down. The ordinance does not consider the human factor of what people want and what they can afford. Some people won't do it, and they will leave voluntarily.

S. Craig asked if she would be willing to provide economic data regarding her buildings and she said she would.

The Chairman asked if anyone else wished to address the Committee or if anyone had any questions?

Mrs. Elardo asked what level of retrofit the City Hall was upgraded to when the addition was completed? B. Prodoehl stated it was retrofitted to Level 4.

Mrs. Elardo asked what that cost the City? Mr. Prodoehl said he did not know but he could find out for her.

Mr. Prosser asked if the Community Meeting Room was reinforced with concrete in-fill? Mr. Prodoehl said it was.

Mr. Prosser asked if the cost of retrofitting such a large building might be comparing apples and oranges? Mr. Prodoehl said he thought that was probably right.

Bill Kallunsky, 1110 Woodland Ave, Ojai, was concerned about the economics. He does not believe there is a problem, an earthquake problem, in Ventura. There have been no deaths reported due to earthquakes. There is no problem. He wanted to know how much labor costs the City has spent on this issue up to this time? He said the City is asking the property owners for money, so he wanted to know how much the City has spent on this so far.

S. Chase pointed out to Mr. Kallunsky that State law requires the City of Ventura to comply with the State law.

Mr. Lefcourt, 350 Paseo de Playa, Ventura, owns two buildings on Main Street. The tenants are barely able to pay their rent. The prospect of retrofitting the buildings would be out of the question. As a businessman he would not be able to afford to do this. He asked if the City has paid for the restoration of the Peirano Building.

E. Millais said the City had.

Mr. Lefcourt said he would question the merits of this. He was a successful salesman for 50 years. He stated the City should not wait until an earthquake happens to get help; they need help now. He suggested the City help the property owners and forget about the revitalization project. It is a losing proposition. It will chase all the business away from the Downtown area. This is a serious problem. He stated he did not understand the reason for the project.

There being no one else wishing to be heard, the public hearing was closed.

The Chairman then adjourned the meeting for a 10 minute break.

After 10 minutes, the Chairman called the meeting back to order.

The Chairman stated the request before the Committee was for an extension of time for 90 days.

E. Millais asked the Deputy City Attorney, Jim Neuerburg, about the CEQA guidelines and public review and comment period.

Mr. Neuerburg explained the time limits and the CEQA guidelines. He stated the guidelines should not be ignored. There is no requirement in law that the public review period be any longer than 45 days.

E. Millais pointed out that the public review and comment period actually would be longer than 45 days by 5/14/91 since the period started 3/22/91. He added that most of the points brought up this afternoon are included in the draft EIR. There are very few environmental affects that could not be mitigated. And with regard to the few comments about environmental effects, he stated to the Committee the issues could be better served by forming policy questions to consider these and answer them. This could be done even after the public comment period ends on 5/14/91. The ordinance will not be drafted until at least August, 1991.

With regard to the previous request from the Ventura Downtown Association requesting an extension of time, no action was taken and they were told the draft ordinance would not be considered until at least June, 1991.

Several introductory workshops were held with the City Council and they have asked for several more public workshops. Staff is trying to schedule these. One will be in late June and one in July. So the opportunity for public comment will not be impeded by moving forward at this time. This is not a new issue and the process was started almost two years ago.

Further, Mr. Millais noted there has been coverage of earthquakes in the news and a tremendous amount of press about this issue. The solutions are not different than they have been. Yet the policy and economic issues are real. They remain outside the context of the draft EIR report and he would not be willing to debate them further. He thought those issues will remain whether we have an EIR or not and whether there is an extension of time or not.

S. Jones agreed with his remarks. He stated he also would not be in favor of approving an extension. And he was not in favor of an extension in April when the Downtown Ventura Association requested this. He believes that most of the issues raised today are covered in the draft EIR report. The City Council always allows public input at its hearings on these items. He thought the Committee should move forward and get these issues resolved, which won't be done until the report is before the City Council.

Thereupon, S. Jones made a motion to deny the request for an extension of time. E. Millais seconded the motion.

S. Chase asked the consultant, Steve Craig, if the comments and issues presented today by the public, such as regarding the accident figures for fires, drownings, and economics, would be added to the draft EIR.

S. Craig said he agreed with Mr. Millais that most of them were already included in the draft report. The new issues heard today, can be responded to without significant time for revisions. All the issues addressed will be covered in the final EIR document.

With regard to the economic issues, Mr. Craig said he did not believe these belonged in the EIR report. These are policy considerations. Further economic information should be provided by the property owners or collected by staff.

E. Millais said he would like to see this done as part of the public comments. He asked Mr. craig to contact the property owners and obtain information from those who indicated they would be willing to provide it. This is not a CEQA issue but the information is inherent and beneficial in these considerations.

S. Jones said he would also like to see the information obtained from all the property owners and not just those here today.

Virginia Gould asked the Chairman if she could comment in this regard. It was the consensus of the Committee to allow her to speak.

Ms. Gould said the purpose and extent of the EIR report was changed from when she first asked about the EIR. The City added the six alternative options and that introduced the economic factors. It also changed the purpose from saving people to saving buildings for economic uses. The EIR addresses that and projects what it would cost if the structure is strengthened or not. The property owners did not ask for this.

E. Millais disagreed. He believes the economic issues were always a part of this subject.

Mr. Hibbs then asked the Chair if he could make one last comment. It was the consensus of the Committee to allow him to speak.

Mr. Hibbs asked the Deputy City Attorney if, in his opinion, the 45-day extension was possible?

Mr. Neuerburg stated it was possible because nothing precludes it. It is built into the CEQA guidelines because on some larger projects, sometimes the time periods are extended.

S. Jones asked if it was legal for the Committee to not extend the time period. Mr. Neuerburg stated this was correct.

Mr. Hibbs hoped the Committee would consider extending the time period in an effort to reduce the "us versus them" attitude.

The Chairman then reviewed the questions asked by the public and asked Mr. Craig if these were included in the draft report. Mr. Craig indicated that the issues mentioned today were already covered in the draft report. However, he would like to obtain more factual data about the status of the property owners. If this is available, then they can expand the report and modify the conclusions reached. This, however, depends upon the building owners providing information.

E. Millais stated he would like to meet with the property owners to further discuss this issue. He did not feel that the end of the public comment period will mean the end of the discussion of the issues.

Upon voice vote, the motion to deny the request for an extension of time of the public comment period carried unanimously.

The Chairman stated there will be a public meeting to review and respond to the final EIR document and determine if it is sufficient. The public will have the opportunity to provide further written comments on the draft EIR until 5/14/91. Workshops will also be scheduled by the City Council.

Environmental Impact Report Review Committee Minutes

(1) Andrew Chakires

The question regarding the degree of compliance with the State Unreinforced Masonry Law is subject to several interpretations. As explained in the EIR, the law requires that unreinforced masonry buildings (both bearing wall and in-fill types) be inventoried and that a mitigation plan be developed to reduce the life safety hazards associated with such structures. As interpreted Statewide, such mitigation plans range from voluntary compliance to the adoption and rapid implementation of mandatory strengthening programs. The range of interpretations of what constitutes a mitigation plan is very broad (as discussed in Chapter 3 of the Final EIR--see also the table in Chapter 3 that summarizes variations in hazard mitigation programs throughout California. The State Unreinforced Masonry Law empowers the local government (in whose jurisdiction such buildings exist) with the authority to define the scope and content of the mitigation plan. As interpreted by the State Seismic Safety Commission, the preferred mitigation plan is one which involves adoption of (1) a single specific technical standard for each jurisdiction, (2) a time frame for implementation, and (3) mandatory rather than voluntary compliance. Inc practice, these objectives have only partially been met in many cases.

The commentor has either misinterpreted or only partially understood the Rutherford and Chekene report on the Loma Prieta earthquake referenced in this comment. As detailed in the Final EIR and in responses to comments provided below, all of the available evidence suggest that in every case documented in the literature, strengthened buildings outperform unstrengthened building **if** the strengthened building is structurally upgraded to an accepted design standard (e.g., a **Level II** standard). Based on statewide evidence, it is uncontestable that strengthening does improve the performance of unreinforced buildings in an earthquake. The degree of reinforcement is directly related to the future performance of a building; however, reinforcement does not assure that a building will not be damaged by a moderately strong earthquake. However, if significant strengthening is required (e.g., a **Level III** standard), life loss potential is very significantly reduced even if an earthquake produces strong local ground motion, and building damage reduction is assured. That a building owner may still need to fund restoration after a strong earthquake--even with upgrade to a **Level III** standard--is true. The amount of repair work necessary after a strong earthquake can only be estimated.

The evidence in the EIR has been carefully assembled to provide an accurate depiction of the consequences of adopting one of several types of ordinance. More specific information would be needed to address the objections made in the third paragraph of this comment.

The issue of risk is fully explored in both the Draft and Final EIRs. Additional technical documentation related to the probability of a movement along the San Andreas, Pitas Point, and other regional faults is provided in the Final EIR and in responses to comments below. The article referenced in this comment accurately depicts the problem facing the City Council in deciding (1) what upgrade standard to adopt and (2) whether to make such a standard voluntary, mandatory, or based on some other even such as a change in occupancy or ownership.

(2) James Prosser

The data presented in the Appendix reference were not used in the Seismic Risk Model; the critiqued reference was part of the original Kariotis inventory which was completed over six years ago. This inventory was included in the Appendix only as a reference to the history of City activities complying with the State Unreinforced Masonry Law.

Objections to the Seismic Risk Model have been fully addressed in responses to comments below and in the Final EIR. This model is based on conventional, accepted methodologies for seismic design which do not differ significantly from seismic evaluation procedures used for the construction of new buildings. There is nothing unique or mysterious about the model; it simply expands upon accepted procedures for seismic design and earthquake prediction. The reliance on this model is no different from seismic engineering calculations for other types of structures.

Predicting the number of building demolitions that may occur if a mandatory strengthening standard is adopted is a very difficult undertaking for a variety of reasons. The most reliable source of information about this problem is the experience of cities in the State which have adopted mandatory strengthening programs. However, even this existing information has failed in most cases to take into account the rate that demolitions were occurring prior to adoption of an ordinance. Comparative information about demolitions resulting from adoption of a mandatory strengthening standard is provided in the Final EIR. Developing a casual link between adoption of a strengthening standard and building demolitions is difficult to achieve. Basically, once a mandatory program is put in place, a building owner must make an economic calculation about how to proceed: should a $10.00 to $15.00 per square foot investment be made in a building that could still be damaged if a moderately strong quake occurs? Would the investment in strengthening be sufficient to prevent substantial additional expense if a strong earthquake occurs? If a building is not highly leveraged and if sufficient capital is available, would such an investment make economic sense of would a higher return be provided by demolishing a structure and creating a new mixed use building with far greater potential for return? All of these (and other questions) need to be considered by a building owner when contemplating demolitions as a response to a mandatory strengthening program. However, given the wide range of economic outcomes, it is difficult to establish a causal link between a mandatory strengthening program and demolition. The statewide, documented statistical relationships between adoption of mandatory programs and demolitions and the history of demolitions in Ventura are provided in the Final EIR.

The issue of the affordability of a mandatory upgrade program is addressed as completely as possible (given responses to the economic questionnaire prepared by the consultant) in the Final EIR. Refer to the discussion of local economic effects in Chapter 11 of the Final EIR.

(3) Joseph Puopolo

The degree to which the City would participate in funding a mandatory strengthening program is currently under consideration by the City Council and will be resolved in the future.

(4) John Hibbs

The two possible objectives of a mandatory strengthening program--(1) a reduction in death and injury risk and (2) diminishing property damage and economic impacts resulting from a moderately strong or strong earthquake--are clearly defined in the statement of purpose in the Final EIR Summary. The necessary strengthening to achieve one or both of these objectives are presented in the final EIR as well both in text and graphic form. Comparative risks from other sources of death and injury are also discussed in the Final EIR.

The performance of strengthened buildings is discussed in the Final EIR. In addition, considerable economic analysis has been performed to determine the effects of any proposed ordinance on building owners and tenants.

(5) Marcum Patrick

The availability of bank loans is discussed in the Final EIR. Bank loans are available for unreinforced building upgrades if the loan applicant is able to demonstrate a clear ability to repay loans. The City is presently negotiating with local banks to determine the future availability of commercial loans for upgrading. Other sources for funding the upgrades (other than property owner investment) are discussed in the Final EIR. The commentor is correct that many of the available funding arrangements are difficult to implement. Refer to the discussion of the Ojai joint City-private property owner strategy for funding discussed in the Final EIR.

Issues related to comparative risks from other sources of potential death and injury are now discussed in the Final EIR.

The preparation schedule and costs for the Final EIR were established based on the comments received and the scope of necessary additional research (particularly related to economic concerns) necessary to complete the Final document. The anticipated effects on tenants are described in the Final EIR.

(6) Thomas Wood

The potential economic effects on tenants and the potential for building owners to dispose of current tenants as a result of upgrading are issues that are now discussed in the Final EIR. Clarification of issues related to 12-2 have been made in the Final EIR. Issues related to a time extension for review of the Draft EIR were discussed by the EIR Committee. Refer to concluding pages of the Minutes for a review of the Committee's decision regarding an extension.

(7) Ray Russum

These comments are acknowledged. The EIR clearly demonstrates (based on the experience of cities impacted by the Loma Prieta quake) that adverse economic effects result for businesses and tenants occupying or in proximity to unreinforced buildings. The economic effects of various levels of strengthening are now discussed in the Final EIR.

(8) Helen Elardo

Responses to these oral comments regarding the accuracy of data input to the model are provided in the response to written comments provided by the same commentor. Economic concerns have now been addressed in detail in the Final EIR. The degree of economic hardship anticipated under each level of upgrade has been estimated.

The phasing of implementation of the ordinance is an important consideration. Phasing alternatives considered in the Final EIR include delayed implementation of a **Level I** program, a nested **Level I/Level III** program, and implementation upon change of occupancy or sale of a property.

(9) William Chilcutt

The demolition option in response to mandatory strengthening is discussed in detail in the Final EIR. Also, refer to prior responses to this issue. Demolition may be the most feasible choice for some building owners while compliance with an adopted standard may be more favorable for other owners. The demolition question is complex, and, to be predicted accurately, requires considerable knowledge of an individual building owner's financial status.

The commentor is correct that most injuries and deaths resulting from a quake with local MMI values of VII or less are related to falling parapets, breaking glass, and failing (or absent) wall anchors. Above VII MMI intensity, other types of failure will result. A **Level I** program would reduce death and injuries from the most common sources of unreinforced building failure. **Level II and III** retrofits would protect against injury when MMI intensities of VII through IX are experienced (probable values for a strong motion on the Pitas Point Fault). Refer to the Final EIR for a discussion of MMI values and typical failure patterns.

(10) Virginia Gould

The issues raised in paragraphs 3 and 45 of Virginia Gould's comments are addressed in the Final EIR and in response to written comments provided by the commentor. Fire code occupancy figures were not used. Refer to the explanation of the occupancy values which is included in the Final EIR and in the Technical Appendix on the Seismic Risk Model.

Unstrengthened buildings are the greatest threat to earthquake safety in the Downtown Ventura area. Other types of structures and facilities that have high earthquake failure rates (tilt-up concrete and non-ductile concrete buildings and facilities) are either not present in the Downtown Ventura area or are present in low density compared to unreinforced buildings. Unreinforced buildings are one of the most common source of earthquake fatalities within the older , downtown portions of most California cities. Unstrengthened or partially strengthened freeway bridges and other public structures are currently being reviewed statewide to determine what types of strengthening are necessary to prevent a repetition of failures experienced during the recent Loma Prieta earthquake.

Virginia Gould (continued response from prior page)

The unreinforced masonry law is designed to address both publicly and privately owned buildings. Much of this comment takes exception to the scope and content of the State URM Law which was not established by the City. The buildings that were excluded from the scope of the State URM Law were either very low occupancy buildings or they were generally thought to be seismically relatively stable due to the presence of a significant number of internal walls.

The EIR is designed to provide a description of alternative methods of complying with State law. No single method of compliance is required nor does the EIR recommend a specific course of action. The environmentally superior option has been identified as required by CEQA. An alternative has also been identified that considers the economic data included in the Final EIR.

(11) Mark Thomas Evans

The comments provided by Mr. Evans are acknowledged. The EIR identifies that the proposed ordinance would result in severe hardships for a small percentage of building owners in the Downtown area. The economic data obtained during preparation of the Final EIR confirmed the more general data in the Draft document.

(12) Malcolm Cornett

Comments acknowledged. No response is necessary.

(13) Bambi Ruebe

The comments made by Ms. Ruebe are acknowledged. The recommendation to perform parapet strengthening and wall anchoring prior to requiring more intensive upgrades is sensible. Whether the City should invest directly in the assistance of upgrading buildings that are only upgraded to a **Level I** standard, however, is questionable. The affordability of the proposed ordinance and effects on tenants are considered in greater detail in the Final EIR.

(14) William Kallunsky

Comments acknowledged. The economic consequences of ordinance adoption are now discussed in the Final EIR in considerable detail. The amount of money spent thus far on sesimic retrofitting of public buildings has not been computed by the City.

(15) Mr. Lefcourt

The costs of the upgrade program for building owners and tenants are discussed in the Final EIR.

CITY OF OJAI
401 SOUTH VENTURA STREET
P.O. BOX 1570/OJAI, CALIF. 93024
TELEPHONE (805) 646-5581
FAX (805) 646-1980

30 April 1991

RECEIVED
MAY 0 1 1991
Dept. of Community Development
Planning
San Buenaventura

Peggy Woods
Assistant Planner
Planning Department
City of Buenaventura
Post Office Box 99
Ventura, California 93002

Dear Ms. Woods:

RE: DEIR 1468 CITY OF BUENAVENTURA
UNREINFORCED MASONRY BUILDING ORDINANCE

Please accept this letter as a comment on the subject DEIR.

Section 10.3 of the DEIR discusses the City of Ojai's unreinforced masonry rehabilitation efforts within the downtown area and, specifically, the Arcade Rehabilitation project. The discussion contains what we believe to be certain misstatements of fact and erroneous assumptions I would like to clarify on behalf of the City.

With respect to the technical conclusions (page 10-6, paragraph 1) that "the Ojai upgrade requirements are similar to the Ventura Level I upgrade," please refer to the attached letter from the project engineer, Mr. John Nelson, S.E., with Howard Stup and Associates. According to Mr. Nelson, the criteria used for the Arcade project were nearly identical to the Ventura Level II upgrading criteria.

From a merchant disruption standpoint, it is probably misleading to compare the Arcade project with other mitigation programs, for a couple of reasons. First, the project involved the rehabilitation of thirteen privately owned unreinforced masonry buildings and the Arcade itself, simultaneously. Most other mitigation programs proceed on a building by building basis. Secondly, this project, due to the interconnection between the Arcade and the adjacent buildings, as well as a number of interdependences between the buildings themselves, was done as a public works project. Again, most other mitigation programs are done on a building by building basis, and construction is privately arranged. Unfortunately, this was not possible in our case due to the overlap of private and public responsibilities.

City of Ojai
Andrew S. Belknap letter dated April 30, 1991
Page 1

The reference to the similarity between Level I Ventura proposals and the Ojai upgrade standard has been revised. The statement in the Draft EIR was intended to relate the underlying seismic resistance objectives of the two programs. The treatment of open store fronts (the Ventura Level II program) is now referenced as the basis of comparison between the two programs.

The problem of interdependency between adjacent structures due to the presence of party walls and the related problem of continuous building rows of unreinforced structures are common to both cities. Performing block by block upgrades in coordinated manners to minimize construction disruption has been adopted in other cities and may be used by the City of Ventura. The presence of the arcade distinguishes conditions in Ojai and Ventura but not significantly when the topic of concern is predicted tenant disruptions. Coordinated block by block construction actually reduces the overall inconvenience and disruption that would be experienced by tenants. Several cities are establishing seismic rehabilitation assessment districts and other related mechanisms which convert an upgrade program from an entirely private to a private-public joint undertaking.

In order to proceed, we had to receive building owner agreements both to the assessment district (to pay costs attributable to building improvements) and for the construction. The construction agreements indemnified the City from lost business claims, as the City believed it could not afford this potentially open-ended risk.

As the report states, on page 10-6 in the third paragraph, this was a prevailing union wage job, but not because federal funding was received, as stated. All public works projects are subject to these provisions. This also was why the low bidder was selected (a complaint voiced in the first paragraph of page 10-8). That is the nature of public works contracts.

Finally, it is true that rain damage was a substantial problem, but not because the roofing work proceeded into the rainy season, as stated in page 10-6 of the report. The rain damage occurred in September and early October as the result of unseasonably early rains. The construction was largely complete by mid-November.

It should be noted that because it was a public project, the Arcade rehabilitation was highly visible. It was by far the most expensive, controversial, and ambitious capital project the small City of Ojai had ever undertaken. As a result, the project did illicit strong opinions for and against. It should also be noted that the project had many supporters. A volunteer fundraising group called Friends of the Arcade was able to raise over $80,000 in voluntary donations towards the project, with almost 300 individuals, families, or companies, contributing.

I know first hand of the many real disruptions seismic upgrading work can cause, and that many of the business and property owners in the Arcade were upset with the project. While I would not want to minimize this concern, it is one that must be balanced against the very real public safety and economic risks associated with unreinforced masonry buildings in earthquake prone areas. I must say that now that the Arcade project has been completed, we have seen some significant private investment in the commercial buildings, and the area seems to be busier than ever. Your consultant might want to test this assumption, but generally the project seems to have had a positive long term impact on the downtown economy.

Sincerely yours,

Andrew S. Belknap
City Manager

Encl.

City of Ojai
Andrew S. Belknap letter dated April 30, 1991
Page 2

Comments regarding indemnification are acknowledged. Insurance considerations should be considered by the City of Ventura if any joint public-private undertakings materialize in the development of a mitigation program.

The rationale for the use of prevailing union wage labor has been corrected in the Final EIR.

Late spring and summer are the time periods of minimal or nonexistent rain in California. The text of the EIR has been revised slightly to mention unseasonably early rains as the explanation for rain damage.

Information about the Ojai upgrade, which is considered a creative and successful example of a block-scale strengthening program, has been expanded to include references to public support for the project, volunteer contributions, and public perception of the value of the upgrade. The discussion in this EIR has been retained which illustrates typical tenant disruptions with upgrading while businesses remain open. The experience of Ojai businesses was typical of state-wide conditions.

Comments acknowledged regarding the long term benefits of the reinforcement program. Excerpts from this final paragraph have been incorporated into the final EIR.

HOWARD F. STUP & ASSOCIATES

CONSULTING STRUCTURAL ENGINEERS

April 18, 1991

RECEIVED
APR 19 1991
City of Ojai

City of Ojai
401 S. Ventura Avenue
Ojai CA 93023

Attn: Andrew Belknap, City Manager

Re: Ojai Arcade Rehabilitation
Project RA-89-1
City of Ojai
HFS&A #870755

Gentlemen

We have had an opportunity to review the City of Ventura's draft environmental impact report prepared for their proposed unreinforced masonry ordinance. As you are aware, Article 10.3 of their report contains discussion about the Ojai Arcade Rehabilitation. This Article contains several misleading statements which we take exception to.

The level of seismic upgrading for the rehabilitation project was established after the completion of a site specific seismic analysis. The analysis was performed by modeling earthquakes as random events cognizant of both historical, geological, and geophysical data. The analysis was completed by Staal, Gardner, and Dunne, Inc. (SG&D), Consulting Engineers and Geologists. Their findings reported that an effective peak acceleration (EPA) between 0.21g and 0.25g can be expected in the City of Ojai with a 10% probability of exceedence in 50 years. This corresponds to a Seismic Zone 2B as defined by the Uniform Building Code (Seismic Zone 4 being the highest).

Technical criteria utilized for the Arcade Rehabilitation project is based on the ABK Methodology (ABK, 1984) for an EPA zone of 0.2g. Because the determined EPA is slightly higher than the assigned seismic zone some specific criteria was modified to comply with 0.3g zone criteria. This criteria is nearly identical to the City of Ventura's Level II URM upgrading requirements and not Level I, as incorrectly stated by the report. The seismic rehabilitation work to the Arcade and contiguous buildings consisted of not only parapet bracing and wall anchorage, but also addressed diaphragm shear bolting and interconnection between adjacent buildings, brick veneer stabilization, strengthening of URM walls for out-of-plane loading, and in-plane strengthening of the Arcade piers and arches for mitigation of the open store front condition along the Arcade.

601 DAILY DRIVE • SUITE 205 • CAMARILLO, CA 93010 • 805-987-7887

It would have been useful to have had the technical data provided in this letter for inclusion in the Draft EIR. Excerpts from the letter have been incorporated into the Final EIR. The discussion of the seismic upgrade standard and how it was derived were not the primary topic of the referenced section of the Draft EIR. Rather, the data was included primarily to provide comparative information about disruption to tenants during the upgrade. Sufficient information was provided to illustrate that the Ojai program and Ventura's Level II program were similar enough that tenant experiences would be roughly comparable if businesses were to remain open during upgrades.

The technical data in paragraphs 2 and 3 of this comment letter have been summarized and included in the Final EIR.

The ABK methodology was developed with the primary concept of mitigating the risk of occupant exposure to URM seismic hazards. The level of mitigation varies and is dependent upon the EPA zone assigned to the site. Observed damage to URM buildings after moderate and severe ground shaking has found that elements of URM buildings damaged by severe ground shaking are not necessarily damaged by moderate ground shaking. Seismic Zone 2B is classified as the upper bound of moderate ground shaking, hence, the upgrading work performed on the Arcade and contiguous buildings is not as extensive as if the buildings were located in Los Angeles, a city which is generally identified as being within Seismic Zone 4. However, from the standpoint of seismic hazard reduction the methodology addresses the mitigation of URM life-safety threats with equivalency in either zone. In general, the methodology enhances life-safety concepts by limiting building damage; however, damage control is not the primary goal of the methodology--only a secondary benefit.

The draft report recommends that the City of Ventura consider and adopt a Level III upgrading ordinance. This ordinance would be modeled after the ABK methodology for a Seismic Zone 4. As discussed earlier, their Level II is modeled after the ABK methodology for Seismic Zone 2B. Their consultant's recommendation for this increase is based on the philosophy that probabilistic analysis of seismic ground motion is inappropriate when determining site specific EPA. A single-source deterministic analysis must be made cognizant of the nearest large fault. The consultants have identified the Pitas Point-Ventura fault as the nearest potentially active fault capable of severe ground shaking (maximum probable magnitude 6.25). We disagree with this approach. Probabilistic analysis is the basis of most seismic design. Nothing is certain or perfect. While deterministic analysis may be prudent for facilities such as nuclear power plants and other critically essential facilities, we accept probabilistic analysis as a reasonable way to establish seismic design criteria without making our recommendations cost prohibitive. The SG&D site specific seismic analysis for the Arcade rehabilitation project includes the Pitas Point-Ventura fault within the analytical model, but only as a probabilistic random event, not as a single-source deterministic event. Nevertheless, the analysis is not greatly influenced by this fault, but rather is influenced by the Arroyo Parida-Moore Ranch fault (maximum probable magnitude 6.25) which is located just to the north of downtown Ojai.

The rationale for selecting the upgrade standard used for the Ojai Arcade presented in this paragraph has been summarized and included in the Final EIR.

The difference between a probabilistic and single source model for seismic design criteria has been clarified in the Final EIR (see revised summary and text in the Chapter on the Seismic Risk Model). It is important to stress that the purpose of the Seismic Risk Model was to predict both single source earthquake effects and probabilistic summaries of annual risk. The consultant is not formally recommending adoption of the environmentally superior option; the analysis of significant effects was designed to provide the decision-makers with an accurate description of both the environmental and financial consequences associated with various alternatives. A number of options and alternatives were considered ranging from voluntary compliance to mandatory strengthening to a Level III standard. The incorporation of cost to benefit issues into the equation of decision-making and adoption of a probabilistic approach to seismic hazards indicates that a Level I (or Level II standard when considering open store fronts), clearly provides adequate life safety protection for probable seismic events anticipated over the next 2 or 3 decades. This comment provides a useful synopsis of the decision-maker's dilemma in judging what level of life safety and building damage reduction should be adopted for Ventura.

The seismic hazard analysis and upgrading work completed to the Arcade and contiguous buildings is appropriate and beneficial in the mitigation of URM life-safety threats. Additional upgrading work to further enhance damage control was not seen as being cost beneficial to the mitigative effort.

Very truly yours

HOWARD F. STUP & ASSOCIATES

John P. Nelson, S.E.

Comment acknowledged. It is possible that the decision-makers will come to a similar conclusion for Ventura.

RESOURCE MANAGEMENT AGENCY

county of ventura

THOMAS BERG
Agency Director

TO: Ann Chaney
Planning Director
FAX 652-0865

DATE: May 13, 1991

FROM: Tom Berg by mkh

SUBJECT: EIR 1468 - Unreinforced Masonry Ord.

The subject document was received on Apr. 27, '91 for review. It was circulated to the appropriate County agencies. The response is attached. Please mail a copy of the Final document when completed.

If you have any questions, please contact Kim Hocking at (805) 654-2414 and he will direct you to the appropriate staff member.

Reference No. 91-35

Attachments

cc: Sheriff-OES-Smith

Government Center, Hall of Administration Building
800 South Victoria Avenue, Ventura, CA 93009 (805) 654-2661

County of Ventura Resource Management Agency
Transmittal letter dated May 13, 1991

No response necessary.

County of Ventura

MEMORANDUM

To: Kim Hocking, CAO's Office

Date: May 3, 1991

1991 MAY 7 PM 2 40

From: Jan Smith, Sheriff's OES

Reference No.: SSOES 91-068

Subject: City of Ventura Unreinforced Masonry Ordinance Draft Environmental Impact Report (EIR - 1468)

After reviewing the documents prepared for the City of Ventura by the Planning Corporation of Santa Barbara, my impression is the project was done very thoroughly. There is a compilation of historical material in direct relation to the ordinance as well as comprehensive studies of other areas that have been affected by earthquakes in the California region. The studies were focused on structures similar to those in the City of Ventura.

The recommendations of this study, on the whole, appear to be taking responsible considerations of the safety of the population, response and recovery of the city. In retrofitting buildings, whether they are residential or business related structures, all aspects of inconvenience as well as actual loss of revenues were taken into consideration. In most cases, it appears business may be able to stay in operation (either by being temporarily relocated or "excuse the dust" types of operations) while residential inconvenience will impact greater. The document tends to look at the retrofitting process to be done methodically in the city by targeting specific areas of the city to be retrofitted during a specific time frame rather than disrupting all areas at the same time.

Part of the concerns that may arise is the cost vs. life safety. The planning scenario uses the San Andreas fault as a lesser event in terms of damage and injury when local faults have the potential to provide more direct shaking resulting in more damage. According to reports I have previously read, this is a very logical approach.

In addition, pages 7-1 through 7-12 were absent from the report.

We thank you for the opportunity to review this project. If you have any questions, please call at (805) 654-2551.

County of Ventura Sheriff's Office
Jan Smith letter dated May 3, 1991
Page 1

Comments acknowledged. This letter summarizes some information contained in the EIR and indicates concurrence with the upgrade program objectives promulgated by the City. No additional response is necessary.

VENTURA REGIONAL SANITATION DISTRICT

1001 PARTRIDGE DRIVE, SUITE 150 • VENTURA, CA 93003-5562

A Public Waste Management Agency

May 13, 1991

RECEIVED
MAY 14 1991
Dept. of Community Development
Planning
San Buenaventura

Ms. Peggy Woods
Planning Division
501 Poli Street, Room 117
Ventura, CA 93001

COMMENT ON DRAFT EIR FOR UNREINFORCED MASONRY ORDINANCE

After reviewing the EIR, I just wanted to ask that it be expanded to include some general discussion of the volumes of demolition materials associated with the proposed project and each alternative. In this regard, perhaps a chart could be included in the EIR that would indicate tonnages or cubic yards of materials by type and also specify whether they are considered hazardous or non-hazardous. If you would desire to discuss the organization of the data further, please feel welcome to contact Mr. Drake Van Camp at 658-4623.

WILLIAM S. CHIAT - MANAGER
RESOURCE PLANNING & DEVELOPMENT

/mg

cc: Wayne A. Bruce, General Manager - Ventura Regional Sanitation District
Drake Van Camp, Principal Planner - Ventura Regional Sanitation District

Ventura County Regional Sanitation District
William S. Chiat letter dated May 13, 1991
Page 1

Attempting to estimate how many buildings may be demolished as a result of implementation of an upgrading program is a relatively complex question. Depending on whether an ordinance requires voluntary or mandatory compliance and depending further on the level of strengthening required, building demolitions could range from virtually no demolition to loss of 7 to 10% of the inventory through demolition. The economic impact of various levels of strengthening and the equity which an owner has in a building are other variables that would effect the number of demolitions that may occur. In brief, with the exception of an ordinance that requires building demolition, it is not possible to estimate with precision what tonnage of material for disposal would be generated by the various ordinance options. Nonetheless, the construction effects chapter of the Final EIR contains a discussion of possible demolition effects. Several mitigation recommendations, including stockpiling and recycling of demolished brick, have been proposed for consideration by the decision-makers.

Southern California Association of Governments
Letter dated May 2, 1991
Page 1

No response necessary.

SCAG 25 YEARS OF SERVICE
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West Seventh Street,12th Floor • Los Angeles, California 90017-3435 • (213) 236-1800 • FAX (213) 236-1825

AREAWIDE CLEARINGHOUSE MEMORANDUM

DRAFT ENVIRONMENTAL IMPACT REPORTS

Project Applicant: San Buenaventura, City of, Attn: Peggy Woods,Plan.Div. 501 Poli St.; Ventura 93002

SCH No.:

Project Title: Unreinforced Masonry Ordinance, DEIR

SCAG No.: VE-54801-EDR

Date: May 2, 1991

The project title and SCAG number should be used in all correspondence with SCAG concerning this project. Correspondence should be sent to the attention of the Clearinghouse Coordinator. SCAG Staff can be reached by telephone at (213) 236-1800.

/X_/ We have reviewed the above project and determined that it is not regionally significant. Therefore, the project does not warrant clearinghouse comments. However, the lead agency may determine the project's impacts and recommend appropriate mitigation measures.

Paul Hatanaka

PAUL HATANAKA
Clearinghouse Official

RECEIVED
MAY 08 1991
Dept. of Community Development
Planning
San Buenaventura

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, *Governor*

CALIFORNIA COASTAL COMMISSION
SOUTH CENTRAL COAST AREA
925 DE LA VINA
SANTA BARBARA, CA 93101
(805) 963-6871

April 18, 1991

City of San Buenaventura
Department of Community Development
Attn: Ms. Peggy Woods
501 Poli Street
Ventura, CA 93002-0099

Re: Notice of Completion of Draft Environmental Impact Report, (EIR-1468), for the City of San Buenaventura's Unreinforced Masonry Ordinance.

Dear Ms. Woods,

[ ] There seems to be no significant environmental impacts associated with this project.

[ ] The Commission has no comment at this time. However, a Coastal Development Permit will be required from our office.

[ ] The Commission has no comment; please refer to your certified LCP when issuing the Coastal Development Permit for this project.

[ ] There are some significant coastal issues raised by this project. Please contact ____________ at our office.

[X] The Commission may have some comments; however, due to budget and staff limitations, we are unable to comment in the given time frame.

[ ] The project appears to located outside the coastal zone. All public agencies carrying out or supporting activities outside the coastal zone that could have direct impact on resources within the coastal zone shall consider the effect of such actions on the coastal zone resources. (PRC Section 30200(a)).

Thank you for the opportunity to comment on this document.

Sincerely,

James Johnson
Area Manager

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APR 23 1991
Dept. of Community Development
Planning
San Buenaventura

BB/JJ
0223M

California Coastal Commission
Letter dated April 18, 1991
Page 1

No response necessary.

STATE OF CALIFORNIA PETE WILSON, *Governor*

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO, CA 95814

May 09, 1991

PEGGY WOODS
CITY OF SAN BUENAVENTURA
501 POLI STREET
VENTURA, CA 93001

RECEIVED
MAY 13 1991
Dept. of Community Development
Planning
San Buenaventura

Subject: UNREINFORCED MASONRY ORDINANCE
SCH # 89080918

Dear PEGGY WOODS:

The State Clearinghouse submitted the above named environmental document to selected state agencies for review. The review period is closed and none of the state agencies have comments. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call Tom Loftus at (916) 445-0613 if you have any questions regarding the environmental review process. When contacting the Clearinghouse in this matter, please use the eight-digit State Clearinghouse number so that we may respond promptly.

Sincerely,

David C. Nunenkamp
Deputy Director, Permit Assistance

Governor's Office of Planning and Research
Letter dated May 9, 1991
Page 1

No response necessary.

RECEIVED

MAY 14 1991

Dept. of Community Development
Planning
San Buenaventura

Ms. Peggy Woods
City of San Buenaventura
Post Office Box 99
Ventura, Ca 93002

Subject: Environmental Impact Report

Dear Ms. Woods:

I am not going to saturate your mind with counter-statistics, environmental or even economic issues that the EIR neglects to address.

I simply want to know what exactly the State of California requires from each city in regards to Unreinforced Masonry Buildings, and why our city council would bother considering an ordinace requiring any more than Level One reinforcement.

You written response would be greatly appreciated, in addition to copies of documents supporting that response.

Most Sincerely,

G. Marcum Patrick
Chairman
Committee to Preserve Historic Ventura

COMMITTEE TO PRESERVE HISTORIC VENTURA

Committee to Preserve Historic Ventura
Letter dated May 13, 1991
Page 1

Information in paragraph 1 is not sufficiently specific to provide a response.

State of California requirements are outlined in Section 3.2 of the Final EIR (Legal Background). The specific mandates in the State Unreinforced Masonry Law include (1) developing an inventory of structures subject to the law and (2) implementing a mitigation plan designed to provide for reducing the life safety hazards of such structures. The State legislation allows each local jurisdiction to develop the details of mitigation programs. Both mandatory and voluntary upgrades have been required by different jurisdictions in the State. **Table 3-17** in the Final EIR presents a summary of how different cities in the State have implemented the law.

Harry R. Hibbs Phone: (805) 644-7458
290 Maple Court - Suite 200
Ventura, CA 93003

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MAY 2 1991
Dept. of Community Development
Planning
San Buenaventura

April 30, 1991

Peggy Woods, Planner
City of Ventura
P. O. Box 99
Ventura, California 93002-0099

Re: Draft EIR for Proposed Unreinforced Masonry Ordinance

Gentlemen:

I reside at 2829 Surfrider, Ventura, California. I have a financial interest in properties affected by Ventura's proposed unreinforced masonry ordinance ("the Project").

The following comments and objections are offered in connection with the public input portion of the Draft Environmental Impact Report on Proposed Unreinforced Masonry Ordinance prepared by the Planning Corporation of Santa Barbara ("the Consultant") for the City of San Buenaventura dated March 1991 ("the Draft EIR"):

Inadequate Description of the Project's Objectives

The Project can be designed to accomplish an almost unlimited number of alternate (and sometimes mutually exclusive) objectives.

For example, the Project could be designed to strengthen Ventura's unreinforced masonry buildings to the point that they will not suffer any damage in quakes with a Richter scale magnitude of less than 8.25 or the Project could be designed to strengthen Ventura's unreinforced masonry buildings to the point that they will not totally collapse in quakes with a Richter scale magnitude of less than 8.25 or the Project could be designed to strengthen Ventura's unreinforced masonry buildings to the point that they will not totally collapse in quakes with a Richter scale magnitude of less than 6.25.

Because the Draft EIR does not define the Project's objective(s), the Project's benefits, detriments, and available mitigation measures, if any, cannot be satisfactorily addressed and assessed; ergo, objection is hereby made to the Draft EIR's lack of a precise definition of the Project's objective(s).

The development of an ordinance to reduce hazards related to seismic events has two basic objectives: (1) the reduction of life loss and minimization of injury and (2) building damage reduction. The EIR clearly presents these objectives and the revised EIR summary even more precisely defines these objectives and the different levels of strengthening necessary to achieve each goal.

The lack of a clear distinction between the life safety and building damage reduction goals and the relationship between these two objectives and the necessary strengthening to implement each goal is a debate that engineers have not resolved. This problem is discussed fully in the EIR and in the Technical Appendix. Even though there is no simple answer to a question that is directed to the issue of life safety versus building damage reduction, it is possible to frame at least a partial answer to the question. If the primary goal is to reduce life loss in the most cost effective manner, the Level I upgrade is clearly the most beneficial option. If building damage reduction is also a goal, or if very effective life safety measures are sought that will minimize death even if a strong locally centered quake occurs, then increasingly complicated solutions (Level II or III) are recommended.

Inadequate Description of Directly Affected Buildings

Further objection to the Draft EIR is hereby made because it fails to precisely describe the buildings that will be directly affected by the Project.

In connection with this objection, you should note the Draft EIR's inventory of directly affected buildings is limited to a 1985 inventory prepared by a different consultant. This inventory is both obsolete and wrong.

At a minimum, proper planning for the Project must start with a full and complete inventory (by street address) of each existing (strengthened and un-strengthened) unreinforced masonry building located within Ventura's city limits with the following information shown in chart or other easily readable form: (1) the date the building was first completed; (2) the type and character of the building's underlying soil determined by actual test; (3) the present construction quality of the building determined by recent inspection; (4) the building's height determined to the closest foot; (5) the height of the building's contiguous neighbors determined to the closest foot; (6) for each exterior bearing wall, the distance between said exterior bearing wall and the contiguous neighbor's bearing wall; (7) whether the building shares a bearing wall(s) with another building(s); (8) if the building shares a bearing wall with another building, for each wall so shared, the type and quality of said wall and the street address of the sharing building; (9) the building's present use; (10) the average number of people occupying the building determined (during regular business hours) by physical survey and not by square footage or occupancy load; (11) the average number of people immediately adjacent to the exterior of the building (determined during regular business hours) by physical survey and not by Santa Barbara's pedestrian count; (12) the existing features of the building, if any, determined by physical inspection, that are likely to cause the building to present unusual earthquake hazards such as, but not limited to, large parapets or large lineal windows; (13) the dollar amount of damage, if any, the building suffered in each quake from 1910 to the present with a Richter scale magnitude of more than 5.6; (14) the type of strengthening work, if any, previously performed on the building; and (15) the date the strengthening work was completed.

Inadequate Description of Ventura's Earthquake Experiences

Further objection to the Draft EIR is hereby made because it fails to adequately and completely provide historical data about the nature and extent of earthquakes directly affecting Ventura and its buildings.

The 1985 inventory prepared by the City with the assistance of John Kariotis included buildings that are no longer on the Ventura list of structures potentially subject to an ordinance. The commentor is correct in concluding that the 1985 list, which is partitioned into building use categories, is less than completely up-to-date. Buildings excluded from the proposed ordinance and structures that have already been upgraded have been removed from the table included in the Final EIR. The present list in Chapter 3 has been compiled to provide a summary only of buildings subject to the proposed ordinance.

The second paragraph includes a list of data requested by the commentor that are very encompassing. Items 4, 5, 6, 7 & 8 are included in the Kariotis inventory in the Technical Appendix. Item 1 is often information that is either unavailable or obtainable within a time frame which includes a margin of error of nearly ten years. Also, since very little technological evolution occurred in the design of structural support for masonry buildings, little significant difference exists between buildings constructed prior to 1910 and between 1910 and 1930 (except some minor anchoring). Item 2 has been provided, at least in a general manner, in the recent Staal, Gardner & Dunne analysis of liquefaction/amplification potential in the City. Item 3 would require a building specific engineering evaluation which would be inordinately expense to undertake for an EIR type of analysis. Items 9 and 10 are generally determined based on tax and business license survey data which is included in the 1985 list of structures (included in the Technical Appendix). Item 10 is not the relevant standard for seismic design; by long term engineering convention, building code occupant loads are used for design standards because current uses may not accurately reflect long term or future tenancies. Item 11 was information collected in a field program performed in support of the Rutherford and Chekene risk analysis. Item 12 is addressed indirectly in the Kariotis inventory. The ground accelerations from earthquakes that have affected the downtown part of Ventura since 1910 cannot be determined based on Richter magnitudes. The Modified Mercali Index (MMI), an ordinal scale based on qualitative judgements (but limited to local ground acceleration estimates), is the more proper scale for assessing the strength of historic earthquakes which occurred prior to the development of the Richter scale. Regarding items 15 and 16, see the expanded discussion of this issue in the Final EIR chapter on engineering design. Previously strengthened buildings are not subject to the present ordinance proposal. Most voluntarily upgraded buildings in downtown Ventura have been upgraded to Level I or II standards.

See the revised discussion of the earthquake history for Ventura included in the chapter of the Final EIR addressing seismicity and local geology.

At a minimum, in chart or other easily readable form set forth in the body of the document, the Draft EIR should provide the following historical information about each quake felt in Ventura with a Richter scale magnitude of more than 5.6 at its source: (1) the quake's date; (2) the quake's source; (3) the quake's Richter scale magnitude at its source; (4) the source's distance from downtown Ventura; (5) by street address, the location of each Ventura building (including homes) damaged by the quake; (6) by street address, the dollar amount of damage suffered by each Ventura building; (7) the number of people who were killed in Ventura by the quake; (8) the number of people who were seriously injured in Ventura by the quake; (9) the name of each person so killed or seriously injured in Ventura; and (10) the cause and location of each death or serious injury.

Also, for each damaged unreinforced masonry building listed in answer to the previous set of questions, at a minimum, the Draft EIR should provide the following historical data (in chart or other easy reference form): (1) the street address of said building; (2) the dollar amount of the building's damage; (3) a physical description of the damage, i.e., wall failure, or corner collapse, or parapet failure; (4) the number of people killed or seriously injured by said building; (5) the location and cause of each serious injury or death; (6) whether the building was strengthened before the quake; and (7) if the building was strengthened before the quake, the nature and extent of the strengthening work and the date it was completed.

Inadequate Information about Pitas Point - Ventura Fault

The Draft EIR claims there is one chance in 100 that the Pitas Point - Ventura fault will produce an intense Ventura quake within the next 30 years. Further objection to the Draft EIR is hereby made because the Draft EIR fails to give significant, relevant, historical data about the Pitas Point - Ventura fault.

At a minimum, in the body of the document, the Draft EIR should provide the following information about the Pitas Point - Ventura fault: (1) the depth of the Pitas Point - Ventura fault; (2) the length of the Pitas Point - Ventura fault; (3) the pathway of the Pitas Point - Ventura fault; (4) the date the Pitas Point - Ventura fault was discovered; (5) the date the Consultant (or any other person or agency) started monitoring the Pitas Point - Ventura fault; (5) the log of the Pitas Point - Ventura fault with the name of the agency responsible for maintaining the log and the time intervals between each noted activity; (6) the date of the last quake attributable to the Pitas Point - Ventura fault; (7) the epicenter of the last quake attributable to the Pitas Point - Ventura fault; (8) the Richter scale magnitude of the last quake attributable to the Pitas Point - Ventura fault;

Some of the information requested in this list of questions has now been incorporated into a summary discussion in the Geology and Seismicity chapter of the Final EIR. The underlying question that this list of data requests raises is: have prior earthquake experiences affected Ventura as significantly as the predictions in the Seismic Risk Model? This question is actually not relevant for this reason: the last comparable movement to what is predicted (in the Seismic Risk Model) on the San Andreas occurred in 1852 prior to the construction of most of the unreinforced buildings in downtown Ventura. A number of adobes in Santa Barbara and Ventura were damaged in this earthquake but, other than anecdotal information from historic accounts of the quake, little else can be stated with certainty. The recurrence interval for strong movements along the southern portion of the San Andreas is about 100 years (a very rough estimate); for this reason, the probability for a movement roughly comparable to the 1852 quake is 30% in the next 30 years, a high probability in earthquake prediction modelling. The probability of occurrence for a moderately strong to severe quake along other less active faults in the region is lower than an event on the San Andreas. One hundred years, in geologic time, is obviously a very brief time span. The concern of the proposed ordinance is with prevention of life loss primarily and building damage reduction secondarily. That the destructive earthquake has not yet come to pass in downtown Ventura is not a cogent argument for declining consideration of a strengthening standard. Prior to the Loma Prieta, exactly the same logic was applied to buildings in the Watsonville-Santa Cruz area which now, since the Loma Prieta quake, have been demolished.

The Pitas-Point Ventura Fault

The focus of this set of questions is on only one of many active and potentially active faults in the Ventura region. The purpose of including the Seismic Risk Model evaluation of the Pitas-Point Ventura Fault is illustrative of what types of building damage and life loss could occur if one of many such faults in the region were to move. The fault in question has not moved in the downtown Ventura area in the time period during which the City of Ventura has existed as a historical entity (since the latter part of the 18th century). There are a large number of similar faults located in the Ventura vicinity which have the potential to result in moderate to severe damage to buildings in downtown Ventura.

At a minimum, in chart or other easily readable form set forth in the body of the document, the Draft EIR should provide the following historical information about each quake felt in Ventura with a Richter scale magnitude of more than 5.6 at its source: (1) the quake's date; (2) the quake's source; (3) the quake's Richter scale magnitude at its source; (4) the source's distance from downtown Ventura; (5) by street address, the location of each Ventura building (including homes) damaged by the quake; (6) by street address, the dollar amount of damage suffered by each Ventura building; (7) the number of people who were killed in Ventura by the quake; (8) the number of people who were seriously injured in Ventura by the quake; (9) the name of each person so killed or seriously injured in Ventura; and (10) the cause and location of each death or serious injury.

Also, for each damaged unreinforced masonry building listed in answer to the previous set of questions, at a minimum, the Draft EIR should provide the following historical data (in chart or other easy reference form): (1) the street address of said building; (2) the dollar amount of the building's damage; (3) a physical description of the damage, i.e., wall failure, or corner collapse, or parapet failure; (4) the number of people killed or seriously injured by said building; (5) the location and cause of each serious injury or death; (6) whether the building was strengthened before the quake; and (7) if the building was strengthened before the quake, the nature and extent of the strengthening work and the date it was completed.

Inadequate Information about Pitas Point - Ventura Fault

The Draft EIR claims there is one chance in 100 that the Pitas Point - Ventura fault will produce an intense Ventura quake within the next 30 years. Further objection to the Draft EIR is hereby made because the Draft EIR fails to give significant, relevant, historical data about the Pitas Point - Ventura fault.

At a minimum, in the body of the document, the Draft EIR should provide the following information about the Pitas Point - Ventura fault: (1) the depth of the Pitas Point - Ventura fault; (2) the length of the Pitas Point - Ventura fault; (3) the pathway of the Pitas Point - Ventura fault; (4) the date the Pitas Point - Ventura fault was discovered; (5) the date the Consultant (or any other person or agency) started monitoring the Pitas Point - Ventura fault; (5) the log of the Pitas Point - Ventura fault with the name of the agency responsible for maintaining the log and the time intervals between each noted activity; (6) the date of the last quake attributable to the Pitas Point - Ventura fault; (7) the epicenter of the last quake attributable to the Pitas Point - Ventura fault; (8) the Richter scale magnitude of the last quake attributable to the Pitas Point - Ventura fault;

In seismic design, the accepted principle used for judging what type of building engineering to require is based on probabilities related to a consideration of the anticipated movements and potential ground accelerations of the full range of known faults in the vicinity of a proposed structure. The merits of adopting a probabilistic (rather than fault specific) approach to the reinforcement debate are presented in the revised summary in the Final EIR. The annual probability risk assessment in the Seismic Risk Model approximates the judgements used in engineering design for unreinforced buildings.

Refer to the revisions in the Final EIR summary and Geology and Seismicity chapter of the Final EIR for a discussion of the issues raised by this comment.

The following additional responses to this comment were provided by Rutherford and Chekene:

Two seismic sources are included in the Seismic Risk Model. The first source is the San Andreas fault system, Central and South segments. The total segment length is 536 km, maximum magnitude is 8.0 for the central segment and 7.75 for the southern segment [see references 7 and 8 at the conclusion of the responses]. The annual slip is between 35 to 67 cm. There have been 255 events in the past 187 years, the 1897 earthquake being the largest with magnitude 7.9 [Reference 9], 8.25 [Reference 10]. The second source is the Pitas Point-Ventura fault which is an east-west trending reverse fault. The length is at least 50 km. The slip rate is about 2.4 cm/year. Most historical small earthquakes are associated with the eastern end of the fault. Movement of the fault has apparently formed a scarp in Holocene-age sediments. There have been 119 events recorded near the fault, the 1941 Santa Barbara earthquake being the largest with a magnitude of 6.0 [References 9, 11]. The consultants have assigned a maximum magnitude of 7.25 in conformance with the CDMG database [References 7, 8]. Both sources are considered active and are included in State of California Alquist-Priolo Special Studies Zones.

(9) the distance from the source of said last quake to downtown Ventura; (10) the date or dates the Pitas Point - Ventura fault caused downtown Ventura to shake with a Richter scale magnitude of 7.0 or more; and (11) the source of all evidence the Consultant used to answer the questions that have been herein posed about the Pitas Point - Ventura fault.

Inadequate Historical Data about Failures

The Consultant devotes an entire chapter (chapter 3) to the strengths and weaknesses of various strengthening ordinances, but the Consultant does not concisely and coherently present historical data about earthquake related failures to strengthened or un-strengthened unreinforced masonry buildings. Without this information, the need for a strengthening ordinance (and the benefits to and the detriments of the various strengthening ordinances) can't be properly evaluated. Consequently, further objection is hereby made to the Draft EIR because it fails to clearly and coherently give essential historical data about earthquake related failures to strengthened and un-strengthened unreinforced masonry buildings, including, but not limited to, defining the part(s) of strengthened and un-strengthened unreinforced masonry building's that are most likely, and least likely to fail in an earthquake.

At a minimum the Draft EIR should provide the following historical data (in chart or other easy reference form) for each California earthquake with a Richter scale magnitude of more than 5.6 at its source: (1) the date of the quake; (2) the quake's Richter scale magnitude; (3) the quake's source; (4) the number of un-strengthened unreinforced masonry buildings located within 60 miles of the source; (5) the number of strengthened unreinforced masonry buildings located within 60 miles of the source; (6) the dollar damage to all buildings and structures located within 60 miles of the source, including homes; (7) the total number of people killed by the quake; and (8) the cause and location of each death.

Also, for each **damaged and un-strengthened** unreinforced masonry building located within 60 miles of the quake's source, at a minimum, the Draft EIR should provide the following historical data (in chart or other easy reference form): (1) the street address of said building; (2) the dollar amount of said building's damage; (3) a physical description of said damage, i.e., wall failure, or corner collapse, or parapet failure; (4) the number of people killed or seriously injured by said building; and (5) the location and cause of each serious injury or death.

Also, for each **damaged and strengthened** unreinforced masonry building located within 60 miles of the quake's source, at a

The information about building failure patterns related to unreinforced buildings is thoroughly discussed in the EIR. It is a topic that requires some familiarity with engineering principles. Chapter 5 of the Draft EIR contains concise descriptions and illustrations of building failure patterns and Chapter 8 summarizes information about building failure patterns observed after the Loma Prieta quake. Information about the performance of strengthened buildings is also contained in Chapter 8. A general description of building hazards is found in Chapter 4 and fatalities in masonry buildings resulting from historic earthquakes are provided in Chapter 12. In addition to all these references, a section on historic earthquakes and fatalities has been incorporated into the Final EIR summary. The specific issue addressed in this comment about the most hazardous components of these types of buildings is described in both Chapter 5 and 8. The answer to this question is simple: parapet failures are one of the primary causes of death in unreinforced buildings. A Level I strengthening program would eliminate the most common source of fatalities; this conclusion is now highlighted in the EIR summary. Such a program, however, does not provide effective building damage reduction in the event of either a moderate or strong quake.

minimum, the Draft EIR should provide the following historical data (in chart or other easy reference form): (1) the street address of said building; (2) the dollar amount of said building's damage; (3) a physical description of said damage, i.e., wall failure, or corner collapse, or parapet failure; (4) the number of people killed or seriously injured by said building; and (5) the location and cause of each serious injury or death.

The Historical Data Against Strengthening Isn't Presented

Further objection to the Draft EIR is hereby made because the Consultant claims and/or assumes any strengthening ordinance adopted by Ventura will reduce earthquake related damages to unreinforced masonry buildings and/or reduce the risk of death or injury from earthquake related failures of unreinforced masonry buildings.

These claims and assumptions are directly contrary to the facts.

At a minimum, the Draft EIR should clearly and concisely present the following historical data taken from the "Final Report on Damage to Unreinforced Masonry Buildings in the Loma Prieta Earthquake." This report covers 5,564 unreinforced masonry buildings located in San Francisco and its 20 surrounding cities. 100 of these buildings were strengthened before the quake and the remaining 5,464 were un-strengthened. The results were: ,

DESCRIPTION	UN-STRENGTHENED BUILDINGS NUMBER	UN-STRENGTHENED BUILDINGS PERCENT	STRENGTHENED BUILDINGS NUMBER	STRENGTHENED BUILDINGS PERCENT
Undamaged Buildings	4,596	84.11%	75	75.00%
Slightly Damaged	480	8.78%	16	16.00%
Severely Damaged	343	6.28%	8	8.00%
Demolished	45	0.82%	1	1.00%
Totals	5,464	100.00%	100	100.00%

Moreover, the Draft EIR should prominently mention the numerous experts who claim a poorly conceived and/or implemented strengthening plan (or ordinance) is far, far worse than leaving things alone, because the historical data shows strengthening is responsible for the majority of deaths.

For example, in the 1971 San Fernando quake, the freshly strengthened Sylmar Veteran's Hospital totally collapsed killing 47 and, in the 1989 Loma Prieta quake the Cypress Point - Oakland freeway on-ramp (strengthened to withstand an 8.25 quake) totally collapsed killing 46 and, in the 1989 Loma Prieta quake, a partially strengthened warehouse located at 6th and Townsend collapsed killing 6. These deaths are particularly enlightening because only 148 people have been killed in California earthquakes since 1950. Of this total, **99 were killed in (or by)**

The comment about strengthening buildings as a cause of death during an earthquake is a curious reversal of the reality of engineering efforts and seismic resistance. It is not possible to respond to the reference to "experts" who support this proposition because no references are provided to either the sources, assumptions, or conclusions that these experts have made. However, an expert is not needed to conclude that falling parapets are dangerous while braced parapets, if properly engineered, are far less likely to fail and collapse. Likewise, properly anchored walls reduce fatalities and injuries. The causal factors in the deaths in the building at 6th and Townsend (in Oakland during the Loma Prieta) was not due to the "partial" strengthening; it was a result of inadequate strengthening and the interaction of soil amplification and the building's inadequate structural properties. There is no question that tilt-up concrete and non-ductile concrete buildings and facilities are potentially dangerous and have resulted in more fatalities in the last 30 years than deaths from unreinforced buildings. There are, however, far more of these types of buildings and facilities state-wide and therefore, once adjusted for square footage, the risks associated with unreinforced masonry buildings are greater than the risks from non-ductile concrete, masonry infill, or tilt-up buildings (Table 12-3 in the Draft EIR). Since few if any of these types of buildings are present in downtown Ventura, without question, unreinforced buildings in the City of Ventura (within the study area) are unquestionably the single most important potential source of earthquake related injuries and fatalities. The State Seismic Safety Commission is actively promoting legislation to require upgrades to these types of structures and facilities (as well as unreinforced masonry buildings). The logic that strengthening "causes" more life loss is simply erroneous.

The data from the report "Final Report on Damage to Unreinforced Masonry Buildings in the Loma Prieta Earthquake" by Rutherford & Chekene, were taken out of context. The building summaries contain information for areas with wide variations in soils and distances from the fault. Many of the buildings reported as "strengthened" were only partially strengthened, and not in accordance with any recognized standard. The referenced report specifically discusses the data shown in Mr. Hibbs's letter, and on page 30, states:

> *In Santa Cruz, some strengthening to at least eight URM buildings had occurred previously although the level varied and strengthening was often incomplete. As Table 2 indicates, these partially strengthened buildings were damaged and vacated at rates similar to the unstrengthened buildings, but a much higher percentage of unstrengthened buildings were demolished. The weighted average damage to these strengthened structures was 14%, also less than the 28% of the unstrengthened URM buildings.*

In the same report, data for buildings in San Francisco, which is a much more statistically valid data set than the gross summaries used by Mr. Hibbs, indicated an overall average damage ratio of 2.68% for unstrengthened buildings and 1.77% for strengthened buildings. Damage in strengthened buildings was almost all "light," where 139 unstrengthened buildings had "moderate," "heavy," or "severe" damage.

minimum, the Draft EIR should provide the following historical data (in chart or other easy reference form): (1) the street address of said building; (2) the dollar amount of said building's damage; (3) a physical description of said damage, i.e., wall failure, or corner collapse, or parapet failure; (4) the number of people killed or seriously injured by said building; and (5) the location and cause of each serious injury or death.

The Historical Data Against Strengthening Isn't Presented

Further objection to the Draft EIR is hereby made because the Consultant claims and/or assumes any strengthening ordinance adopted by Ventura will reduce earthquake related damages to unreinforced masonry buildings and/or reduce the risk of death or injury from earthquake related failures of unreinforced masonry buildings.

These claims and assumptions are directly contrary to the facts.

At a minimum, the Draft EIR should clearly and concisely present the following historical data taken from the "Final Report on Damage to Unreinforced Masonry Buildings in the Loma Prieta Earthquake." This report covers 5,564 unreinforced masonry buildings located in San Francisco and its 20 surrounding cities. 100 of these buildings were strengthened before the quake and the remaining 5,464 were un-strengthened. The results were:

	UN-STRENGTHENED BUILDINGS		STRENGTHENED BUILDINGS	
DESCRIPTION	NUMBER	PERCENT	NUMBER	PERCENT
Undamaged Buildings	4,596	84.11%	75	75.00%
Slightly Damaged	480	8.78%	16	16.00%
Severely Damaged	343	6.28%	8	8.00%
Demolished	45	0.82%	1	1.00%
Totals	5,464	100.00%	100	100.00%

Moreover, the Draft EIR should prominently mention the numerous experts who claim a poorly conceived and/or implemented strengthening plan (or ordinance) is far, far worse than leaving things alone, because the historical data shows strengthening is responsible for the majority of deaths.

For example, in the 1971 San Fernando quake, the freshly strengthened Sylmar Veteran's Hospital totally collapsed killing 47 and, in the 1989 Loma Prieta quake the Cypress Point - Oakland freeway on-ramp (strengthened to withstand an 8.25 quake) totally collapsed killing 46 and, in the 1989 Loma Prieta quake, a partially strengthened warehouse located at 6th and Townsend collapsed killing 6. These deaths are particularly enlightening because only 148 people have been killed in California earthquakes since 1950. Of this total, 99 were killed in (or by)

A report on the Whittier earthquake of 1987 by the Los Angeles Department of Building and Safety also indicated improvement in performance by strengthened buildings. Thirty percent of nonstrengthened buildings were reported in all damage categories, while only 20% of strengthened buildings reported damage. More severe damage which could cause temporary closure of the building occurred in 5.7% of unstrengthened buildings, but only in 2.1% of strengthened buildings.

The primary purpose of most unreinforced building strengthening is life safety. There has never been a fatality reported in the literature in a building strengthened to a recognized standard. The warehouse at 6th and Townsend in San Francisco was not seismically strengthened. Although irrelevant because they are not masonry buildings, the Sylmar Veterans Administration Hospital was not strengthened either, and the Cypress Avenue freeway structure had only cable ties installed across expansion joints, which cannot be considered strengthening. While few retrofitted structures will perform as well as comparable new buildings, there is no evidence to suggest that strengthening will not improve performance.

strengthened buildings or structures **verses 26 killed in un-strengthened** unreinforced masonry buildings. That's a ratio of almost 4 to 1 despite the fact the un-strengthened buildings and structures outnumber the strengthened buildings and structures by more than 50 to 1!

The Draft EIR Doesn't Cite Enough Authorities

Further objection to the Draft EIR is hereby made because it fails to cite authorities for many of its pivotal conclusions. At a minimum, the Consultant should be directed to furnish a separate citation for each authoritative statement the Consultant makes.

The Draft EIR Fails To Connect its Data

Further objection to the Draft EIR is hereby made because it draws conclusions based on data taken from other areas without showing how that data is relevant to Ventura.

While much can (and should) be learned from the experiences of others, tragic mistakes can (and often are) made by failing to distinguish the relevant data from the irrelevant data.

At a minimum, to reduce the dangers of falling into mistakes caused by irrelevant data, the Consultant must be required to provide foundational data sufficient to show the data or information the Consultant has taken from another area (and in particular Watsonville) is scientifically applicable to Ventura.

The Draft EIR Misuses A Computer Model

Yesterday, smoke and mirrors were used to make mythical characters appear real. Today, computers often perform the same function.

In view of the computer's potential for abuse and the fact the Consultant has not provided sufficient foundational information about the computer model and/or its relevancy to Ventura and the Consultant has not provided any track record for the computer model (like, for example, comparing the computer model's San Francisco EIR projections against the results of the Loma Prieta quake), further objection is hereby made to the Draft EIR because it bases its assumptions and soothsaying about Ventura's earthquake future on an unproven and perhaps totally irrelevant computer model.

At a minimum, the Consultant must provide a full and complete description of the computer model's assumptions with proof that

The references section of the EIR contains a relatively complete bibliography on the topic. Introductory sections of most chapters now cite the principal references used in forming conclusions. Academic references have also been included where they are relevant. References have also been provided at the conclusion of the response to comments section. Revisions have been made in the text of several chapters to provide more citations in parts of the document where conclusions have been made.

The use of state-wide comparative data is justified throughout the Draft EIR. The building failure patterns throughout the state from San Diego to San Francisco are consistent. Differences in anticipated ground accelerations and seismicity are clearly distinguished. The discussion in Chapter 8 of the EIR specifically links ground accelerations experienced to building resistance in Ventura. Kariotis's discussion of possible revisions to the technical standards for the proposed Ventura ordinance specifically address this comment. Nonetheless, a summary of the rationale for using comparative data from cities effected by the Loma Prieta is included in the Final EIR summary.

same are relevant to Ventura plus several comparisons of the computer model's predictions to the results of an actual earthquake.

The Draft EIR Fails to Consider Relevant Mitigation Measures

Further objection to the Draft EIR is hereby made because it limits the mitigation alternatives to the adoption of different strengthening ordinances without comparing the merits (and costs of these ordinances) to historical data and without presenting sensible alternatives such as earthquake orientated education designed to keep people from running onto the street or jumping out of windows, or requiring automatic gas shut-off valves on all or some of the buildings, or requiring shatter proof windows on some or all of the buildings, etc. At a minimum, the Draft EIR should address each and every one of these alternatives.

The Draft EIR is Incomplete

Further objection is hereby made to the Draft EIR because its data and conclusions are significantly affected by liquefaction or the lack thereof, yet no liquefaction tests or studies have been performed (and/or considered) in connection with the Draft EIR. At a minimum, liquefaction tests must be performed and their results must be considered in connection with the EIR.

The Draft EIR Is Too Long and Too Complicated

The Draft EIR exceeds 150 pages by over 500 pages. Most of these pages are consumed with irrelevant statements and misstatements and unsupported opinions. Given the Draft EIR's volume, it is almost impossible to comment on all the mistakes or to put the Project in proper perspective; consequently further objection is hereby made to the length and complexity of the Draft EIR. At a minimum, the Consultant should be directed to limit the length of the next draft of the EIR to 150 pages.

The Draft EIR Is Extremely Prejudice

The Draft EIR's cover shows a partially collapsed brick building. The source of this picture is not identified; but its purpose is obvious, in that, to all but the most informed it yells:

Warning, this is what happens in an earthquake when you don't strengthen old brick buildings.

What the picture doesn't say and what the Consultant does not say is:

Warning, this is a picture of a strengthened building. Notice how it failed despite prohibitive strengthening costs! Don't make the same mistake in Ventura!!!!

This comment regarding mitigation measures contains some useful suggestions and, to the degree feasible, these suggestions have been incorporated into the Final EIR Alternatives chapter. However, glazing (window) standards, automatic gas shut-off values and similar suggestions do not consider the basic objectives of the project which are to improve the structural resistance of buildings to minimize life loss (and possibly, if it is an affordable objective) to decrease building damage.

The liquefaction study referenced in the second comment on this page is now complete and the conclusions of the study have been incorporated into the Final EIR chapter on Geology and Seismicity. The results of the Seismic Risk Model have been modified accordingly. Refer to the Final EIR for updated information.

To enable public comprehension of a complex set of issues, the document was written with thoroughness and public readability as basic objectives. In response to this (and several similar comments), the EIR summary has been reorganized so CEQA issues are clearly separated from policy, design, economic, and advisory concerns. The CEQA-EIR components of the EIR are now clearly identified. In addition, summaries of both the EIR (CEQA issues) and economic/policy considerations have been provided in the Final document.

The source and significance of the cover photo was selected to convey a specific set of ideas which are now explained in a cover photo reference preceding the Table of Contents.

In view of the politics that are involved with the Project, (and because Ventura is the "Lead Agency" in this Project), demand is hereby made that the Final EIR carry said warning under its cover and that every attempt be made to present a full, complete and un-biased view of all of the facts (and available mitigation measures), including, in particular, the most logical **No Project** choice.

Moreover, demand is hereby made that all inflammatory pictures and materials be properly documented and the strengthened buildings and structures be prominently noted in the Final EIR and that equal pictorial space be devoted to the un-strengthened and unreinforced masonry buildings that have survived severe quakes without any damage whatsoever!

Public Project Information

Further objection is hereby made to the Draft EIR because it fails to address the Project's potential effect on Ventura's other policies and programs including, but not limited to, Ventura's water conservation program, Ventura's redevelopment program, and Ventura's affordable housing program.

Requested Inclusions In Final EIR

Request is hereby made that the Final EIR contain the following findings and statements:

> **Exposing the chances of an Earthquake Related Death** - Thanks to Hollywood's sensationalism, Californians believe they have a excellent chance of dying in a California earthquake. While death from a California quake is possible, California earthquake deaths **almost never occur. More to the point, no one has ever been killed in Ventura by an earthquake.**
>
> **Predicting Ventura's Maximum Quake** - California earthquakes follow a 100 to 200 year cycle. Based on this cycle, it is almost certain Ventura will not experience a quake above 5.7.
>
> **Don't Take A Chance with A Strengthening Ordinance** - Ventura's proposed ordinances have not been tested. Moreover, there is no way of practically testing them before an earthquake. While the ordinance could result in a strengthening of Ventura's unreinforced masonry buildings the opposite is also true, because the proposed ordinances and/or their implementation could weaken Ventura's unreinforced masonry buildings. These buildings have already been earthquake tested for 60 years or they have passed each and every test. **Don't take a chance with a strengthening ordinance!**

The assumption that unstrengthened buildings have some property that rather magically protects them from damage during an earthquake has some proponents and advocates (e.g., the Brick Building Defense League and building owner interest groups in some cities). Unfortunately, the physics of ground acceleration and building failure patterns are not mysterious. Indeed, there is a direct, well documented relationship between ground acceleration at an unreinforced building location and the point at which the building will begin to fail. A new graphic has been supplied in the Final EIR that clearly defines these relationships. A ground acceleration of .12g may not result in any substantial or observable damage, while at .4g, parapets will fail, walls will separate, and at .6 to .7g, building failures are massive. The relationship is clear: a building may not show damage at .12g (although cumulative damage may occur that is not visible, or not highly visible), but it will begin to dismantle itself at .6g. To refer to the "survival" of buildings during small ground accelerations does not reveal anything about the buildings' performance during a moderately severe to severe quake.

Some of the information (and some of the conclusions) contained in these concluding paragraphs have been addressed in the Final EIR summary.

Given the size and complexity of the Draft EIR (and my time limitations), in this letter I have attempted to confine my objections and comments to concise remarks designed to expedite Ventura's receipt of a full and adequate EIR. I hope this letter will be received in its intended light and that I will be allowed to further comment on the Project and its EIR.

Please formally notify me of any and all meetings and other matters dealing with the Project or the EIR by written notice mailed to me at 290 Maple Court - Suite 200, Ventura, CA 93003.

Please acknowledge receipt of this letter by endorsing and returning the extra copy of it.

Thank you.

Harry R. Hibbs

Harry R. Hibbs

HRH:np

No response necessary.

Harry R. Hibbs
Phone: (805) 644-7458
290 Maple Court - Suite 200
Ventura, CA 93003

May 13, 1991

RECEIVED
MAY 14 1991
Dept. of Community Development
Planning
San Buenaventura

Peggy Woods, Planner
City of Ventura
P. O. Box 99
Ventura, California 93002-0099

Re: Draft EIR for Proposed Unreinforced Masonry Ordinance

Gentlemen:

Today I am causing two copies of this letter and one copy of my letter of April 30, 1991 to be hand-delivered to you.

Please acknowledge receipt of said letters by signing the extra copy of this letter and returning it to my courier.

Also, please honor my past notice requests by providing me with written notice of any and all meetings and other matters dealing with Ventura's proposed earthquake ordinance and/or its related EIR. Said written notices are to be mailed to me at 290 Maple Court, Suite 200, Ventura, CA 93003.

Also, please make sure the following comments and objections are incorporated into the objections to the Draft EIR:

The Draft EIR Doesn't Properly Identify Or Address Disposal Problems

The Draft EIR assumes the reinforcement work won't be significantly hampered by toxic materials including, in particular, asbestos.

This assumption could prove frightfully wrong because many of Ventura's unreinforced masonry buildings have been renovated or remodeled with asbestos tile floors and/or asbestos ceilings and/or other hazardous materials.

In view of this problem, objection to the Draft EIR is hereby made because one of its material elements (the nature and extent of asbestos material and other hazardous substances) has not been determined by physical inspection of the affected properties and adequate thought to mitigating its hazards has not been given.

A detailed inspection of the building inventory to determine the extent of hazardous substance presence would be (as the commentor is undoubtedly aware) a cost prohibitive undertaking. However, the document contains a discussion of the problem of asbestos remediation during upgrades. Some structures may have interior elements containing asbestos which may need to be removed during upgrades. CEQA does not require detailed information about the presence or absence of a specific type of problem at a specific address; it is properly oriented to the discussion of potential problems and the identification of potential solutions to such problems. The potential existence of an asbestos remediation problem and procedures for removing asbestos during construction are identified in the EIR.

Peggy Woods, Planner
City of Ventura
Re: Draft EIR for Proposed Unreinforced Masonry Ordinance
Page Two

At a minimum, the Draft EIR should identify the existence of all significant hazardous substances by street address and describe the procedures, if any, that should be implemented to mitigate the risks that are associated with the hazardous materials.

Moreover, in view of the Projects significant risks to health and the environment, at a minimum the Draft EIR should specifically designate the location of disposal bins; the routes that will be used to cart the discarded material to its ultimate disposal site; and the steps, if any that should be taken to minimize the disposal hazards.

The Draft EIR Fails to Address Labor Problems

In view of the life threatening nature of a poorly designed and/or implemented restrengthening program (and the environmental impacts that are associated with temporarily or permanently importing labor to Ventura, objection is further made to the Draft EIR because it fails to address the problems and impacts the Project will cause the local government and the local private sector.

At a minimum the Draft EIR should provide the man hours the Project will require of government (by job classification and per hour cost) with an assessment of government's (i.e., Ventura's) ability to presently supply said man hours and the Draft EIR should provide the estimated man hours required of the private sector (by job classification and per hour cost) with an assessment of the local private sector's ability to presently supply said labor.

Inadequate Notice

Also, for the record, objection is made to all proceedings connected with the Draft EIR's public hearings because adequate and timely notice of said hearings has not been given as required by law.

Harry R. Hibbs

Harry R. Hibbs

Harry R. Hibbs
Letter dated May 13, 1991
Page 2

The degree of specificity suggested in the construction effects mitigation process requested in the first two paragraphs of this page is far more specific than would be helpful for giving general guidance regarding asbestos remediation or construction effects mitigation. General suggestions and guidelines have been provided in the EIR. Citing specific construction bin locations on a building by building basis at this time would be unnecessarily restrictive. However, the construction effects mitigation measures have been modified to include consultation and coordination with property owners and tenants.

The size of crews required for Level I upgrades (and for most Level II upgrades) are relatively small as described on pages 5-42 through 5-52 of the Final EIR. Level III programs are more ambitious but also generally are comparable to activities for remodelling. There are already several contractors in the Ventura-Santa Barbara area (and many in the Los Angeles region) that are specializing in earthquake remediation. Therefore, the commentors concerns that labor demands would be growth inducing or that the project would cause other impacts on City government or the private sector are unwarranted. Based on the experiences of other cities requiring upgrades, labor and expertise availability has not been a problem. The noticing issue was discussed at the EIR public hearing.

HELEN J. ELARDO, A.S.A.
APPRAISER
Decorative Arts & Antiques
2341 LEXINGTON DR.
VENTURA, CA 93001

RECEIVED
MAY 15 1991
Dept. of Community Development
Planning
San Buenaventura

May 14, 1991

Peggy Woods
Planner
City of Ventura
Poli Street
Ventura, Ca.

Dear Planner:

I regret not being afforded sufficient time to further study the EIR; however, I have read these weighty books and it is apparent there are serious flaws in the use and selection of data presented. In addition, there are serious ommissions.

By the author's definition (12-10, 12-12, 12-3) the Pitas fault is a a "low probability event" yet by lengthy and convoluted reasoning these same authors recommend mitigation measures based on a 7.5 quake on this very fault.

The authors then ignore historical data as being less relevant than the theoretical seismic oomputer model to establish the effects on life safety and building damage on this same major quake on the Pitas "low probability fault."

However lengthy and detailed the presentation and despite the outpouring of tables and charts, the glaring ommission of empirical data cannot be ignored by reasonable people.

In addition I noted tnat regarding tne base data used on 540 E. Santa Clara, the building is 23,000 square feet NOT 37,176; occupancy is 53 people NOT 186; it is either Class III or IV NOT Class I, it is 3 floors, NOT 2 floors; land is 20,000 square feet NOT 187,272 square feet. These are the errors in data in the report on just one of the one hundred and thirty eight buildings.

The comment in the first paragraph is not sufficiently detailed to provide any response. More specific information would need to be provided to modify the EIR.

The consultants are not recommending any specific mitigation program; policy on this issue will ultimately be established by City Council. The environmentally superior option has been identified (as required by CEQA) which would address the goal of designing a viable mitigation plan for the City. Refer to the revised Alternatives analysis and EIR summary for additional discussion of possible solutions.

As explained in responses to prior comments (see for example the Harry Hibbs letter of April 30), historic data is only one source of information to be considered by the Council in deciding what upgrade standard to adopt. Historic data are not relevant for predictions about effects of the San Andreas since the last moderately severe quake on this fault occurred prior to the construction of most unreinforced buildings. Comparative data from other regions (which has been incorporated into the Seismic Risk Model through conventional seismic analysis) are the most useful predictor of the effects of future impacts to the City from a moderately severe earthquake.

The data used in the Seismic Risk Model were provided to the consultant by the City. To the degree errors have been identified, they have been corrected. The model does not require extraordinary precision in each of the variables measured because the model averages all the data in arriving at a general prediction of effects base on the totality of the inventory. Further, a margin of error is always assumed in modelling.

Yet to formulate the statistics (12-7) the authors have divided our pop. ation into square footage in URM buildings and use occupancy loads and thus this data alone greatly alters the formulas used. As I told the EIR committee, the data should be corrected before making an ordinance based on this EIR.

Yours very truly,

Helen J. Elardo

Helen J. Elardo
Letter dated May 14, 1991
Page 2

The commentor is correct that to the degree significant mistakes occur in the data base used in the EIR, the conclusions in the model would be in error. However, as explained on the prior page, the averaging of variables for the entire building inventory would minimize the significance of even several mistakes in the data base.

JOHN W. HIBBS
402 Lynn Drive
Ventura, California 903003
Phone - (805) 643 5639

CITY MANAGER'S OFFICE
CITY DE SAN BUENAVENTURA
91 MAY 14 PM 2:57

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MAY 15 1991
Dept. of Community Development
Planning
San Buenaventura

May 14, 1991

Peggy Woods, Planner
City of Ventura
P.O. Box 99
City Hall
Ventura, California 93002 0099

RE: **DRAFT EIR PROPOSED UNREINFORCED MASONRY ORDINANCE**

As per promises to me made by members of the Planning Commission on May 9, 1991 and by Mayor Francis at City Hall during its public evening session last night, May 13, 1991, I expect to see the following answer and/or comments incorporated into the Draft Environmental Impact Report (EIR) now under study:

1. WHAT IS THE PURPOSE OF THIS DOCUMENT?

Please define exactly what is the purpose of this EIR, with specificity, but not limited to, these questions:

a) What is the legal background behind the need for this E.I.R. and, if adopted, how do its facts legally bind the City of Ventura?

b) Is this to be the defining, primary document on which proposed "earthquake" ordinances will be based?

c) When the work was assigned to the Consultants, were they specificially required to compile data with respect to these compiling:

+ economic data on at least some Ventura URM buildings including data about rents, costs, and cost of reconstruction for various levels of ordinance demands and if so where was this incorporated into the Report?

+ data on the actual historical performance on each and every URM building in Ventura and comparing that data with a comparable number of other Ventura buildings either "strenghtened" or non-URM, and if so, where is that in the Report?

1a. The purposes of an EIR are clearly outlined in the Introduction to the document. Once certified, an EIR represents a good faith attempt to accurately describe the environmental consequences of a proposed undertaking. Certification of an EIR does not mandate adoption of a proposed project. On the contrary, many projects are denied after preparation of an EIR.

1b. Yes. This EIR will serve to advise the decision-makers regarding the environmental consequences of an ordinance.

1c. Economic data concerning upgrade costs are included in the Draft EIR. The sources of information used include data collected in Ventura and comparative information from other jurisdictions (Ojai, Santa Barbara, Los Angeles, San Francisco and other cities). Ventura is not particularly distinct from these other cities (regarding unreinforced masonry problems). In addition, in response to comments, additional detailed information about the affordability of the project has been obtained from building owners and incorporated into the EIR.

The issue of the historic performance of buildings in Ventura has been discussed in prior responses (see for example, responses to the same question posed by Harry Hibbs) and information in the revised EIR summary.

Peggy Woods, Planner, City of Ventura

- data on the actual amount of money URM building owners had available to spend and comparing that actual amount of money to actual work that could be accomplished and a projection of the safety that amount of money could "buy"? And if so where in that Report is that data?

- data on how the risk of earthquakes in Ventura compares to other earthquake-risky cities in California, and if so where in that Report is that data;

- data on how earthquake risks to life saftey compares to other kinds of public safety risks such as fire, crime, traffic drowning and flood compare and if so where in that Report is that data?

2. <u>WHY IS THIS REPORT SO LONG AND SO COMPLICATED AND HOW DOES IT COMPARE TO OTHER REPORTS FROM OTHER CITIES?</u>

The two booklets of the draft contain approximately 694 pages as compared to a similiar study by the City of San Francisco. How is it that a city the size of San Francisco, - where the dangers from earthquake are far, far greater than in Ventura - can do their report with so little verbiage.

Prior to or during the drafting of Ventura's draft Report, what other similiar E.I.R. documents were ordered by either the City or the Consultant?

What effort has been made to now compare the E.I.R. completed by San Francisco to the draft now under study?

What information in the San Francisco draft could have been accepted by Ventura as adequate?

And if any of the San Francisco data was acceptable, what cost saving would have been made to Ventura if it had taken the infromation from San Francisco as vs. from its consultants?

1c. continued

This information was obtained during preparation of the Final EIR and is now included in the document.

Comparative data about earthquake risks in other California cities (particularly Santa Monica and San Francisco) are provided in several chapters of the EIR and in the Seismic Risk Model Technical Appendix. Also, some information about this topic is provided in the revised summary in the Final document.

Comparative data about injury and death risks from other hazard sources are provided in the Final EIR.

2. One of the many differences between the EIRs prepared for Ventura and San Francisco concerns the different EIR scope of work statements prepared for each City. The San Francisco planning department also oversaw preparation of a separate socio-economic study (which includes considerable lengthy technical supporting documentation) which was not included in the San Francisco EIR. In fact, San Francisco's study clearly distinguished between CEQA effects on the environment and socio-economic impacts that may result from ordinance adoption. The San Francisco EIR study considered only two issues: effects on historic integrity (cultural resources) and growth inducement/population effects. San Francisco also considered far fewer ordinance alternatives. The same economists and engineers that prepared the San Francisco report contributed to the Ventura study. All of these consultants are currently preparing reports for Oakland and, during the prior year, a similar study was prepared for Santa Monica by the same team. Because there was substantial interest in the EIR on the part of some local building owners, Ventura scoped their document to address a large number of potential problems. In addition, the socio-economic analysis was included in the EIR. The approach in Ventura has been to be very thorough to prevent commentors from objecting to the report on the basis of an incomplete or overly brief analysis. Having achieved the objective of thoroughness, commentors have objected to the report's length. To address this concern, a summary has been provided in the Final EIR which considers all of the major issues included in the Final EIR.

Peggy Woods, Planner, City of Ventura

3. IMPORTANT COMPARATIVE DATA EITHER MISSING OR JUMBLED

No where does this report give us comparative information. The comparative charts we need are shown on the next page; missing from the draft is actual information, or if not missing then too jumbled, to dis-organized to find. To thisend, the balance of this letter is both a suggestion on how to format information I need, either from the Report or elsewhere, and a demand for your office to provide it. i.e., please "fill in the blanks." (See pages 4-9) as follows next.)

This comment is incorrect in asserting that comparative discussions and statistical summaries are not present in the EIR. Chapters 5, 7, 11 and 12 all contain considerable evaluation and all of Chapter 8 is devoted to comparative analysis. Most of the information requested in the charts following this comment page are (1) either impossible to construct due to limitations in available data or (2) have already been included in the Draft EIR. There are several exceptions to this conclusion as discussed in responses to each chart request provided on the pages following.

It is important to note that the charts on the following pages would be based on what is termed in statistics an ordinal rather than interval scale. Interval scales (such as metric or weight measurement systems) allow great precision of measurement whereas ordinal data are usually based on impressionistic, qualitative observations. A typical ordinal scale (e.g., more, much more, very much more, too much) is not precise, cannot be summed or averaged, and has only moderately accurate predictive power. Nonetheless, such scales have some limited utility in social impact assessment. When true rank orders are derivable, such scales can be tested statistically for probabilistic significance.

CHARTS REQUIRED
COMPARATIVE INFORMATION

I. CHART ONE SERIES: ACTUAL VENTURA BULDING PERFORMANCE HISTORY - a comparison

Purpose Of These Charts: Comparative study of actual building performance in Ventura - deaths and severe or collapsed damage only

Size of sample:

All URM buildings in Ventura studied (URM) ______________.

Equal Number of Non-URM buildings (NON URM) ______________

All strengthened URM buildings studied in Ventura (SURM) ______________.

ACTUAL PERFORMANCE HISTORY - QUAKE ________

Note- a chart would be performed for each earthquake that "hit" Ventura would be provided.

	URM	NON URM	SURM
Buildings which collapsed			
Percentage to total			
Buildings severely damaged	NOTE TO PLANNING DEPT - PLEASE FILL IN THESE "BLANKS"		
Percentage to total			
Deaths inside each			
Percentage to total			

John W. Hibbs
Letter dated May 14, 1991
Chart I

A review of the performance of buildings in Ventura during historic earthquakes (to the degree such information is actually available) is provided in the Final EIR summary. The sample of data concerning this topic was insufficient to summarize in a tabular format.

Page Four, May 14, 1991

Peggy Woods, Planner

II. CHARTS ON COST AND SAFETY "BOUGHT"

Purpose: to examine the cost for renovation and the project how much "saftey" is "bought" for this cost.

Sample: 10-15 actual buildings with a 3 charts for each one for each building for earthquakes of magnitudes of 6.0, 7.0, 7.5.

BUILDING NAME - Example Zander Building
magnitude of earthquake ___________

	NO CHANGE	LEVEL ONE	LEVEL TWO	LEVEL THREE	LEVEL FOUR
Cost for Reconstruction In k$					
Deaths					
Collapse Possibility %		NOTE TO PLANNING DEPARTMENT			
Severe Damage Possibility %		PLEASE FILL IN BLANKS WITH			
Modest Damage possibility %		ACCURATE INFORMATION			

John W. Hibbs
Letter dated May 14, 1991
Chart II

The requested information was included in the Draft EIR. Columns 1 ("no change"), 2, 3 and 4 ("level three") are included in many different tables in the Seismic Risk Model discussion and in the cost: benefit chapter of the EIR. Column 5 ("level four") was not included in the comparative tables in the EIR because the consultants determined that undertaking such upgrades would clearly be very cost prohibitive (in many cases, more than new construction). Of the information requested in the rows in this proposed table, row 2 ("deaths") and row 3 were both included in the Chapter 7 discussion (and elsewhere). Reconstruction costs for various options (Row 1) are provided in Chapter 11.

The limitations of the Seismic Risk Model were clearly described in the EIR and the limitations of the model with reference to predicting effects for specific buildings were identified. Because the model uses average values based on the sum of all variables measured, it is not appropriate statistically to attempt to provide greater refinement in the model than is possible with the inherent limitations in the data. To be able to provide the type of building specific information requested in this chart would have required an expenditure of over approximately $500,000 dollars in individual engineering studies of buildings in this inventory. CEQA does not require such specificity.

Peggy Woods, Planner, City Hall

III. CHARTS ON ACTUAL SAFETY RISK FROM EARTHQUAKES AS VS. OTHER MATTERS OF PUBLIC SAFETY RISK

Purpose: To examine in Ventura the risk of death or severe injury from earthquakes as opposed to other "public" risk:

Number of Charts - Three - One each for earthquakes of 6.0, 7.0, and 7.5 magnitude all within 40 miles of city center.

RISK OF DEATH COMPARISON
MAGNITUDE ________

DEATHS HERE

Deaths anticipated by earthquake
Total outside non URM related ________

Deaths anticipated in URM buildings
if no change ________

Level one ____ DEATHS ________

Level two ____

Level three ____ NOTE TO PLANNING DEPARTMENT

Level four ____ PLEASE FILL IN THE BLANKS

If no change, the chances of dying in Ventura (no changes to existing URM buildings, listed in order of highest risk to lowest risk:

Auto Accident One in ____________

Murder One in ____________ PLANNING DEPT:

Drowning One in ____________

Fire One in ____________ PLEASE PROVIDE

Earthquake One in ____________ INFORMATION

Flood One in ____________ HERE

John W. Hibbs
Letter dated May 14, 1991
Chart III

The information requested in the upper half of this table has already been provided in the Final EIR (in Chapter 7) and the data in the lower half have been incorporated into the revised EIR summary. The relevance of the data requested in the lower half of this chart is questionable but has been provided nonetheless.

Peggy Woods, Planner, City Hall, Ven ra

IV. SEISMIC HISTORY IN VENTURA AS COMPARED TO ELSEWHERE

We need a consise, clear, unambiguous summary of the earthquakes that have "hit" Ventura - dates, fault source, size and best etc, together with geologic data indicating some kind of "risk factor" of the main faults as versus other faults, put in perspective with other cities.

For example, would not three or four charts indicating Ventura's relative risk, in X and Y and Z number of years be necessary in our determinations:

EXAMPLE TEN YEAR CHART

ON A SCALE OF ONE TO ONE HUNDRED, WITH ONE HUNDRED BEING COMPLETE CERTAINITY, AND ZERO BEING COMPLETELY UNPREDICTABLE, WHAT FIGURES DO YOU PROJECT FOR: THESE CITIES IN THE NEXT TEN YEARS:

MAGNITUDE	VENTURA	SAN FRANCISCO	LOS ANGELES	MONTEREY	SANTA BARBARA
8.5					
8.0			PLANNING DEPT		
7.5			PLEASE FILL IN BLANKS HERE		
7.0					
6.5					
6.0					
5.5					

John W. Hibbs
Letter dated May 14, 1991
Chart IV

This information is available and was included in prior studies performed for the City (e.g, the ERTEC seismicity evaluation excerpted in Chapter 6 of the Draft EIR); the historic sequence of earthquakes, recurrence probability, and related predictions were included in the Seismic Risk Model. Nonetheless, the commentor is correct that comparative data for other cities is not presented in detail in the EIR (it is not particularly relevant to potential future ground accelerations in Ventura) nor is a table summarizing prior earthquake experiences in Ventura. To the degree feasible, this information has now been provided in the Final EIR summary and in the Geology and Seismicity chapter of the document.

Peggy Woods, Planner, City Hall, Ventura

V. ACTUAL INFORMATION ON ECONOMIC DATA OF BUILDINGS

There is no information whatsoever on actual economic data of the URM buildings, no assesment of the "life" anticipated by their owners if no reconstruction is made, no assesment of this key question:

HOW MUCH IS AFFORDABLE?

I believe that if we took the same 10-15 buildings we examined in the chart described on page four, we could get a realistic idea of not just costs to renovate, but who should pay?

Each building would be determined to support a range of dollars available for renovation, ranging from zero to $$1,000,000. This number would be called the REAL DOLLARS AVAILABLE, on which the following information is needed:

REAL DOLLARS AVAILABLE ZANDER BUILDING $20,000.

COST FOR LEVEL
ONE CONSTRUCTION ____________ SHORTAGE AMOUNT ____________

COST FOR LEVEL
TWO CONSTRUCTION ____________ SHORTAGE AMOUNT ____________

COST FOR LEVEL
THREE CONSTRUCTION ____________ SHORTAGE AMOUNT ____________

COST FOR LEVEL
FOUR CONSTRUCTION ____________ SHORTAGE AMOUNT ____________

Possibly, these could be "high" and "low" charts.

John W. Hibbs
Letter dated May 14, 1991
Chart V

To the degree feasible, the general format outlined in this chart has been used to summarize economic data obtained from building owners during the data collection period between the Draft and Final EIRs. Several other summary charts/tables describing the results of the economic survey have been provided. Conclusions obtained as a result of the building owners economic survey have been included in the revised EIR summary and in Chapter 11.

VI. INSUFFICIENT DATA ON IMPACT DUE TO CONSTRUCTION

No clear information is made on the impact of noise, dirt, conjestion, construction workers injuries or deaths, especially as related to the time frame of anticipated ordinances. This kind of a chart might be helpful

---

DOWNTOWN ENVIRONMENTA IMPACT
TIME FRAME OF CHANGE (FOR EACH LEVEL)
THREE YEAR PERIOD

E X A M P L E   O N L Y

	Traffic	Dirt	Noise	Parking
Three Year Period	Heavy	Dense	Terrible	None
Five Year Period	Heavy	Very Bad	Bearable	Bad
Ten Year Period	Moderate	O.K.	Fair	Fair
Fifteen Year Period	Normal	OK	OK	OK
Twenty Year Period	Normal	Normal	Normal	Normal

CONCLUDING REMARKS

In essense, the draft so far is unreadable, bureaucratic junk. What we need are a very few, very good, analysis of what will happen here in Ventura if various ordinance levels are enacted.

Please sign and return a copy of this letter to me acknowledging your receipt of this letter.

Sincerely,

John W. Hibbs

John W. Hibbs
Letter dated May 14, 1991
Chart VI

This chart attempts to make a simple idea more complex than it needs to be. The chart contains one simple idea/assumption: the extension of construction over a longer period of time would result in less noticeable effects downtown. There are basically two approaches to construction problems associated with upgrading: the option selected by Santa Barbara was to coordinate construction on a block by block basis to minimize prolonged disruption to downtown businesses; the other, more conventional approach, is to establish a variable time frame for compliance with an ordinance based on building occupancy and degree of hazardous exposure. The former approach may be more advantageous for smaller cities while the more conventional approach is probably most appropriate for larger cities. In cases where party walls are present (such as in Ventura), coordinated strengthening on a block by block basis may have substantial advantages for building owners (financially) and tenants (disruptions over a less protracted period of time). Both concepts were presented in the EIR and the block by block approach was recommended for the Main Street corridor, while a more flexible, less organized arrangement was recommended for the remainder of the buildings in the city.

A revised summary has been included in the Final EIR for individuals who prefer not to read the complete document.

May 13, 1991

FORMAL REQUESTS OF JOHN W. HIBBS ON BEHALF OF SELECTED URM BUILDING OWNERS FOR CITY COUNCIL RE: EARTHQUAKE E.I.R

Council Members:

We hereby request of this Council to provide me with the following:

1) That this City goverment shall provide a complete, readable, defendable eqrthquake report that will be the basis on which informed decisions can be inteligently made;

2) That this Report will compare earthquake risks to other life threating risks in a clear, consise manner; that in it it there will be charts and other graphs which will compare the benefits of spending X dollars on URM buildings as vs. the benefits of spending the same amount of dollars on threats from fire, crime, drownings, traffic and/or the benefits of spending those same dollars to strengthen schools buildings and other public buildings.

3) That this report will be backed by actual historical facts of earthquake damage and loss of life HERE IN VENTURA; That it will concentrate its predictions on what is likely to happen HERE IN VENTURA that it will list the probability of dying IN VENTURA by earthquake as vs. dying HERE IN VENTURA by murder, drowning, traffic accident and flood.

4) That this report will take information from building owners HERE IN VENTURA about the maximum REAL dollars actually available from each owner; that it will match these real dollars with a report on what these real dollars will buy in the way of reconstrution and how much real safety can be reasonably expected by that expenditure HERE IN VENTURA; that if there is any shortage between dollars available and construction demanded, that the government will state its response as to how this shortage will be funded HERE IN VENTURA.

5) That this government reverse the last Thursday's decision of its staff to terminate public comment and thereby extend the time for public imput on this report.

John W. Hibbs
Letter dated May 14, 1991

1) This is the intent of this EIR. See the revised document which contains an expanded issues summary.

2) A section has been added to the EIR summary which compares specific risks associated with various causes of fatality. The draft document contained a discussion of comparative risks associated with the occupation of various building types during historic earthquakes. The EIR Committee requested that the consultant compare fatality risks only. The relative benefit of building strengthening investment versus spending money on additional lifeguards, for example, is an issue for the Council to consider, not the consultant.

3) The issue of the historic performance of Ventura buildings to date is only partially relevant to predicting building responses to future events. See prior responses to this question. This issue is now summarized in the Final EIR summary.

4) These questions have been posed to building owners. See the revised economic analysis in the Final EIR. Both the Draft and Final documents contain detailed information about funding alternatives that could be used in Ventura to partially offset the cost of upgrading.

5) This issue was decided by the EIR Committee.

CITY MANAGER'S OFFICE
CITY OF SAN BUENAVENTURA
91 MAY 14 PM 2:57

May 10,1991

%: Peggy Woods, Planner
Planning Division City of Ventura
POB 99
Ventura, Ca. 93002

Dear Council Members and Planning Staff:

I reside at 402 Lynn Drive,Ventura, Ca. I have a 50% interest in an unreinforced masonry building located at 374 E. Main.

In response to the Draft Environmental Impact Report No. 1468, I offer the following comments and objections:

Regarding: Scope of EIR Impacts

Notice of Preparation of Draft Environmental Impact Report #1468 May 26,1989, City of Ventura---Lead Agency lists SOCIO-ECONOMIC IMPACTS AS ONE OF THE AREAS OF STUDY. In fact,the EIR Committee, chaired by Laurraine Brekke, Assistant City Manager,specifically REQUIRED Socio-economic impacts to be included in the EIR. (X 'Determination of Committee, Notice of Preparation).

Contrary to this directive the Planning Corporation of Santa Barbara frequently through out the Draft EIR and Appendix reminds the reader that"socio-economic impacts are analyzed as POLICY CONSIDERATIONS only as socio-economic impacts are not strictly speaking in the domain of CEQA".I object to this assertion as CEQA specifically REQUIRES that certain components of the natural environment which may be adversly effected by various projects must be addressed in any EIR, but, CEQA does not LIMIT the scope of the EIR to the required components.

The question is: Who authorized the draftees of the EIR to violate the directive of the Ventura City EIR Committee? Did the Santa Barbara Planning Corporation discuss the matter with the EIR Committee, Administrative staff or City Council members ? When?
What was the rationale that prompted the draftees not to follow the directive other than the contractors' narrow interpretation of CEQA?

Reg: Socio-economic impacts not addressed in the EIR;

General policy statements are made in the EIR pertaining to the following issues(Draft.p11-19) which are inadequate and do not provide data that is critical to the decision making process.

1.No survey was taken of the number of persons currently employed by commerical, office, and industrial enterprises.
2.There are no projections of the number of employees who will

CEQA does not require the analysis of social or economic impacts along with impacts on the physical environment. Nothing in CEQA precludes a local agency from analyzing social or economic impacts in addition to impacts on the physical environment if the agency determines, as a matter of policy analysis, that an economic analysis is appropriate. The financial effects of an undertaking on building owners are a legitimate economic concern and therefore they have been analyzed in the EIR. However, without an established basis for evaluating such effects in a non-speculative manner, the basic objectives of CEQA would not be met. With the addition of the economic data collection performed during the preparation period between the Draft and Final EIR, it is possible to discuss economic effects with some precision. Without this data collection, it was possible only to partially achieve the objectives outlined in the Initial Study. It is useful to note that the general, state-wide predictions regarding economic hardships discussed in the Draft EIR were validated by the local economic data.

Data Base for the Socio-Economic Analysis

1) The requested survey has not been performed for any other unreinforced masonry studies in the state (to the consultants knowledge). Occupancy and economic activity data indicative of the number of persons employed by downtown businesses is indirectly reflected in several statistics (business licenses, tax reports, etc.). These indirect measures contribute to defining adequate baseline for determining the type and degree of effect that a mandatory strengthening program may have on downtown tenants. Some tenant information was requested of each building owner in the economic questionnaire distributed between completion of the Draft and Final documents. Only a relatively small building owners supplied all of the requested information.

be displaced due to construction burdens, demolition of buildings, closing of businesses/ , etc.
3. There are no projections of the number of residents of residential dwellings or the number likely to be displaced either temporarily or permanently.
4. Costs of relocation of displaced residents and employees were not addressed.
The availability of low income dwellings to relocate the displaced residents was not addresssed.
The availability of employment for displaced employees is not discussed.
5.No survey was taken of the number of residential units in the areas, nor description of the dwellings, multi-story, single story.

Reg: Description of commercial/retail activity in the "downtown area":

1.How many retail units are there in the "downtown area"?
2.How many tenants as opposed to number of property-owner tenancies ?
3.What is the economic stability of the area?
4.What is the capital investment?
5.What is the average length ofleases?
6.What is the going-rate per square foot?

7.What is the economic history of area? The number of failed businesses in past five years? Number of new businesses?

(8) Has there been a progressive increase in sales tax revenue in the past five years? How do the gains/ losses compare with other commercial/retail operations in Ventura?
8.Where is the data that projects the negative or positive effect of the future plans of the Redevelopment Agency on the the central business downtown district?

9. What are the significant irreversible environmental changes in the area which would be involved in the proposed ordinance or six alternate options in terms of current economic loss?

To sum up it is fair to say that there is a glaring omission of all issues that relate to the current or future business climate of the area .Issues which would have a direct influence on the feasibility of the project as well as property owners' decisions demolish their buildings, construct a new building or sell at a depresssed price.

Reg: Occupancy of URM Buildings(The basic element of Risk Analysis)

What evidence is there in the report that a survey was taken of the actual daily occupancy, hours the buildings are occupied and number of days per week the buildings are open as required by URM Law?

Virginia Gould
Letter dated May 10, 1991
Page 2

2) The degree of potential displacement of employees was described in the Draft EIR (in Chapters 5, 7 and 11). Displacement during retrofit varies with the strengthening level adopted and with the construction activities used to accomplish the adopted strengthening objective. (See specifically pages 5-42 to 5-51 of the Final EIR for a discussion of this issue).

3) - 5) Very few of the buildings in the Ventura inventory are residential. To minimize dislocation effects, the consultant has recommended that residential building upgrades be limited to the Level I standard (except in multi-story mixed use buildings). This revision was made in the Final EIR.

Regarding the recommended data collection concerning commercial/retail activity in the downtown area, questions 2, 4, 5, and 6 were included in the property owner questionnaire. A small sample of building owners responded fully to the data request. Item 1 is summarized in other prior studies conducted by the City and is of questionable pertinence to the reinforcement problem. Item 3 is discussed in a summary manner in the revised economic analysis in the Final EIR.

Economic History

The City is currently formulating and implementing long range plans for the improvement and revitalization of downtown (the Downtown Redevelopment Agency Revised Plan and the Specific Plan in preparation). Refer to these sources for discussions regarding future plans and compatibility of the proposed upgrade ordinance with these objectives.

8) Specific sales tax revenue trends for downtown were obtained from the City and are now included in the economic analysis in the Final EIR.

9) Most economic changes are not considered "irreversible environmental effects". Even if every single unreinforced building in the City were demolished and replaced with more conventional, modern buildings, the effects on the downtown area would - at least from an economic perspective - not be significantly adverse over the long term. The replacement of these buildings would be an architectural and historic loss, but not constitute an adverse economic consequence on the City over the long term. Effects on individual building owners would vary on the financial condition and degree to which each building owner is capitalized. Irreversible environmental effects generally refer to permanent losses of or damage to the natural environment, not to changes in architecture, building types or building ownership.

Issues concerning business activities and "climate" are now addressed briefly in the Final EIR. Refer to the revised economic analysis in Chapter 11.

be displaced due to construction burdens, demolition of buildings, closing of businesses/ , etc.
3. There are no projections of the number of residents of residential dwellings or the number likely to be displaced either temporarily or permanently.
4. Costs of relocation of displaced residents and employees were not addressed.
The availability of low income dwellings to relocate the displaced residents was not addresssed.
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What evidence is there in the report that a survey was taken of the actual daily occupancy, hours the buildings are occupied and number of days per week the buildings are open as required by URM Law?

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Letter dated May 10, 1991
Page 2 (continued)

Occupancy Questions: The "URM law" referred to does not require building by building surveys of current occupancies. The approach used in the EIR is typical of studies statewide and the classifications comply with City standards. The occupancies used to estimate the populations at risk from unreinforced buildings are shown in Table 7-1 of the Final EIR. These occupancies are set to estimate the actual number of people exposed to life threatening damage. The statistical values for occupants of buildings come primarily from Reference 1 (see the concluding pages of the Response to Comments for numbered references) which developed tables of actual occupancy at different times of day from a variety of sources. The number of people exposed to such hazards on the street in Ventura was estimated using counts made by The Planning Corporation. Values for both buildings and street occupancy have been checked against comparable estimates made for other purposes in planning studies in San Francisco and Santa Monica and found to be of generally similar magnitude (except pedestrian exposures which are lower in Ventura).

On the other hand, building code "occupancies," normally established for fire exiting, are estimates of worst-case conditions and are not appropriate for use in calculating the at-risk population.

Probabilistic calculations were made on weighted average occupancy values based on probable hours of high and low occupancy. When combined with the probability of various earthquake occurrences, which are assumed to be equal for all times of day, appropriate long-term fatality estimates were derived.

Why would the draftees use occupancy loads that are not in accordence with the Law? .

Why did the draftees use the fire code limitation occupancy recorded in the inventory of URM buildings? What is the relevancy of fire codes to seismic safety? Fire codes are designed to allow occupants quick exit from the building,
What evidence is there that a survey was made of the number of pedestrians at risk near-by the subject buildings in each block or by peak hours of the day or night, or peak season--Christmas back to school,etc.?

If the number of occupants and pedestrians at risk was esssentially unknown how did the Lead Agency establish how many people were at risk?
How did the contractors project the number of fatalities likely to occur?
In the absence of the above information the entire risk analysis is flawed and will remain flawed if accurate information is not fed into the computer.
What is the basis of occupancy loads that were used in the computer model?

Reg: Keriotis inventory taken in 1985:

Why was the Keriotois inventory used in the computer model when the inventory is not current, the square footage recorded is not accurate, use of buildings not current, buildings that have been retrofitted after the inventory remain on the inventory?.

The inventory does not include buildings with "in-fill" non-bearing unreinforced masonry walls required in the URM Law . At some later date these walls will be subject to renovation to meet compliance.This future cost will add to the cost of retrofitting. Why was this critical issue ommitted? .
Has the Lead Agency notified property owners that the strengthening proposals do not include interior non-beasring unreinforced walls? That they are subject to renovation?

Reg: The Draft EIR contains no clear statements regarding:

(1) Statements of the primary purpose of the project:

What is the purpose of the project --to save lives or to save buildings or both as described in Options 1-6 or to save lives as described in Ordinance 88 and the basic purpose of the URM Law?

(2) There is no clear statement of the kind of earthquake the Lead Agency is preparing for.
Is the Lead Agency preparing for a moderate earthquake as stated in Alternate Options 1-6 or moderate to severe as stated

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Page 3

All of the questions raised in paragraph 3 are discussed in detail in the Seismic Risk Model discussion (Chapter 7) and related Technical Appendices. The degree of pedestrian exposure was based on pedestrian counts performed by the Planning Corporation. Compared to nearly identical studies conducted for other cities, the pedestrian exposure risks per 1000 lineal feet were far lower than the mean in other locations in California. The pedestrian exposure risk factors are much lower than state-wide averages.

Kariotis inventory: The Kariotis inventory was not used directly in the Seismic Risk Model. A series of data adjustments were made in the Kariotis survey prior to inclusion in the model. Each building was cross checked with Sanborn map data, square footages were corrected and adjusted, additional data were recorded, and other modifications were made to the data input into the model. The inclusion of the Kariotis inventory (the list of buildings supplied to the state) in the Project Description caused unnecessary confusion; in the Final EIR, the Project Description table includes only unretrofitted buildings subject to the mitigation plan developed by the City. This list is equivalent to the data used for the model.

While "infill" buildings (buildings with URM nonbearing walls fit around a steel or concrete frame) are included in the original State URM law (SB 547), they are generally considered to present a lesser hazard than the bearing wall building. Because of this lesser hazard and because no standards for retrofit exist for these buildings, most jurisdictions under SB 547 have chosen to deal initially only with bearing wall buildings. According to the Seismic Safety Commission (Reference 2), only three of 365 jurisdictions involved have included infill buildings in their programs. Partially because of the difficulty of identification, most jurisdictions have not as yet inventoried these buildings.

Statements of Interest

1) This issue has been discussed thoroughly in prior responses (see Harry Hibbs responses) and is discussed in the revised EIR summary. In brief, Levels I and II are primarily life safety upgrades while Levels III & IV provide both life safety benefits for high intensity quakes and building damage reduction (especially the very costly Level IV program). The degree of building damage reduction achieved with a Level III upgrade in the event of a strong earthquake is difficult to estimate. This is unfortunate but true nonetheless.

2) The probabilistic versus single event concept of earthquake planning is discussed in the revised EIR summary as are the various possible objectives of upgrading. The terms moderate to moderately severe are relative and were not defined with precision in the Draft EIR. In the Final document, an attempt has been made to link these terms with estimates of earthquake force (MMI scale). Refer to the revised EIR for a discussion of these relationships.

in Ordinance 88? What is meant by moderate? Meant by severe?

(3) There is no clear statement of performance goals which relates to :"What is considered an acceptable level of risk? Of loss? How much of a reduction in life loss is the design goal? What source was used to develop acceptable levels of risk? Of loss? If the Lead Agency cannot establish a firm threshold of human life loses what do they recognize as a significant loss or not a significant loss? Do they consider significant or not significant relative to the population of Ventura or just the "downtown area"? Or relative to the number of URM occupants and pedestrians nearby?

What is the policy or criteria the City uses to establish acceptable levels of risk such as the number of policemen needed to safeguard life and welfare of the residents of a community? Or level of fire protection? Number of Lifeguards at the beach? How many lives must be lost on a given stretch of road before remedial action is taken?
Are the same policies and/or criteria applied to the hazards of earthquake and URM buildings?

Regarding estimates of costs of retrofitting:

Do the estimates of costs of retrofitting include engineering fees, administrative fees, permit fees, rental of dumpsters, hauling fees, down time, relocation costs, loss of sales,compensation for inconvenience of tenants, engineering analysis, architectural designs?

The estimates of retrofitting costs were largely based on San Francisco estimates which are not relevant to Ventura.

Information about costs and problems encountered in Ojai are too general to be of value. Why was not substantive information attained from the contractor of the Ojai project? The City of Ojai?
Why did the Ojai bid run over by $800,000? What delayed the project? What level of strengthening was imposed? What problems were uncovered that were not anticipated? How much business was lost compared to the previous year? How much revenue was lost to the city of Ojai, County, State during construction? What were the costs to the the city in terms of services--inspectors. clerks, clean-up, added fire and police protection? How many inspectors and other City personnel were added to the City staff during construction? Are they currently on the payroll? How much did the strengthening cost each property owner or tenant? How many leases were renewed? Were the leases escalated?

Why wasn't the City's experience with the upgrading of the Pierano Building reviewed as an area of information concerning the costs and problems of retrofitting?

Why did the contractors of the EIR not use this available real life data rather than relie on estimates from San Francisco or contrived scenarios to establish retrofitting costs and

As explained in Chapter 5 (page 5-37), there is considerable confusion and contention among engineers about acceptable levels of risk; decision-makers are confronted with identical problems in judging what level of upgrade to require. Life loss is one of several objectives that need to be considered in deciding upon a specific upgrade standard. Other considerations include degree of building damage reduction, program affordability, economic effects if no strengthening is done, and related considerations. The economic value of a single life is difficult (if not impossible) to estimate. Some 'economic' and actuary studies place a value of between one and five million dollars (or more) on a life. Basically, life loss acceptability discussions are based always on the concept that a life loss is potentially acceptable if it is not one's own life that would be lost. Obviously, most people would refuse to place an economic value on their own life. Issues related to comparative life loss from drowning, murder, etc. are not directly comparable and not within the scope or mandate of the State URM law.

<u>Retrofit Costs</u> A broad range of estimates have been provided in Chapter 11. Nearly all of the questions raised in paragraph 3 have been answered in Chapter 11 for various levels of strengthening. Drawbacks resulting from the use of average data have also been discussed thoroughly. Estimates from areas other than Ventura have been used because retrofitting costs within the State are broadly comparable. A Level I upgrade in San Luis Obispo, Ojai, Santa Barbara or San Francisco involves basically very similar activities. Considerable comparative data from San Francisco have also been used in the final EIR.

Specific cost estimates for Level I & II upgrades have been developed for Ventura using studies performed independently of the EIR consultant.

Data gathered from Ojai have now been supplemented with additional information provided by the City and the City's project engineer in comments on the EIR. Please refer to these comments and the revised discussion of the Ojai upgrade contained in the Final EIR. The consultant agrees with the comments that more specific information about financing, unanticipated project delays, and related economic issues would be useful. The City's experience with upgrading planning for the Peirano Block has now been included in the Final EIR.

The use of data from San Francisco (and other cities) is certainly "real life" - - such data are based on larger samples of upgrading experience and therefore comprise a more, not less accurate set of predictors. The costs of upgrading buildings completed thus far in Ventura have now been added to the Final EIR.

consequences of retrofitting projects?.
Is this the kind of information that leads to informed decisions?

Reg: Responses to the initial study for environmental assessment:

The following environmental factors were among the responses prepared for the content of the EIR and were not addressed in the Draft EIR.

What effect would the Alquist-Priola Studies Act have on reconstruction of new buildings,particularly on north side of Main Street?
What was the basis of using soils test data drawn from San Francisco and Watsonville to determine soils conditions in Ventura?
What elements in the underlying soil were the same or similar to soils underlying "downtown Ventura"?
Are the records available that document the similarities?

The report states that underlying soil conditions of the "downtown area" are based on general classifications of soils characteritic of 3 regions of Ventura County.(Ventura County Seismic Safety Element) These classifications were not intended to be used as the basis for site-specific evaluations .The Seismic Element recommends that detailed studies of the soil conditions are NEEDED to evaluate hazard impacts of soil conditions and soil amplification. Were any detailed site-specific tests made? Where ? Where are the records of these investigations? WHAT WAS THE OUTCOME?

Traffic circulation during construction is grossly inadequate.

The EIR speaks of storing dumpsters and construction equipment in the rear of the buildings. How will this be accomplished when access to the rear of many of the buildings do not have access?

Was a survey taken of the number of buildings that have rear access? Those that do not?

How will the trucks pick up the dumpsters stored on the rear of properties that have no access for vehicles?
It is not unreasonable to require the Lead Agency to develop a traffic plan,--map or graph where construction equipment would be parked in each block as each block presents different problems. This is a common practice and requirement imposed on developers of a project.
Has the Lead Agency developed a route plan for trucks to follow en route to the disposal site?

What are the costs the City must bear to repair damage streets caused by heavy trucks coming frequently into the downtown area?. Has the City bugeted for additional maintenance and clean-up which accompanies construction projects?

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The specific responsibilities of a jurisdiction which contains an Alquist-Priolo zone are relatively simple and can be summarized as requiring site-specific geological studies for seismic effects planning to a scale that exceeds such studies for other areas. A specific answer to the commentor's question has been provided in the Final EIR (in Chapter 6).

A much expanded discussion of soil conditions, liquefaction, and amplification factors have been included in the Final EIR. The similarities and differences between soil conditions in Watsonville, Santa Cruz, and San Francisco have also been described more completely in the Final EIR.

The use to which the Seismic Safety Element data was put in the EIR was appropriate: a general identification of areas subject to liquefaction, amplification, and settlement. This information was then supplemented with a downtown-wide subsurface testing program completed by Staal, Gardner & Dunne. The results of the detailed soil studies are included in Chapter 6 of the Final EIR.

To the degree feasible, work involving demolition should concentrate materials storage and disposal in the rear of buildings. There are well established and proven construction techniques for building renovation and construction in urban areas. Because Ventura is a small city and because little new construction has been done in the downtown area, local business tenants are perhaps unfamiliar with the relatively common types of disturbances that occur during construction. Obviously, such disruptions are most noticeable for businesses immediately adjacent to an upgrade site. The Final EIR includes mitigation measures that include tenant consultation/coordination and other measures to reduce construction inconvenience. Building renovations in downtown areas are certainly not unique or unusual undertakings even if local tenants and owners are unfamiliar with such programs. Construction planning coordination on a block-by-block or building-by-building basis cannot be devised until a level of upgrade is selected. To set specific construction activity requirements at this stage of ordinance planning would be too restrictive and would likely result in more rather than fewer problems for tenants.

Construction cleanup and street repair should be minimal. Refer to the discussion of construction activities in Chapter 5 for an explanation of this conclusion.

What effect would the additional expense to the City of the project be on other services the city is obligated to provide for residents? Would these services be cut? Or additional fees levied?,

With the short supply of water and lowered water pressure will the City be able to provide an adequate level of fire protection to the project? Will the increase in water usage during construction reduce the level of fire protection to other areas of the City?

The report does not address future plans of the Redevelopment Agency which have a direct bearing on property owner's decisions to retrofit,demolish, or replace existing building?
What plans does the Redevelopment Agency have for the "downtown" area?.Did the draftees of the EIR consult with the Redevelopment Agency? Did they consult with the current Freedman Consulting firm regarding their plan for downtown Ventura?

Regarding removal of asbestos:
The treatment of the hazards of removing asbestos and costs are not adequately addressed. The EIR assumes because the buildings were constructed before 1934 the presence of abestos would be minimumal. In the 1950's it was common practice to lower the ceilings of retail buildings . It is likely that asbestos tiles were installed in the ceilings and replacment of old floor covering is very likely to be asbestos tile.Was a survey taken of these renovations? Are the reports available?

Removal of asbestos has proven to be very costly, hazardous to workmen. Presents hauling and disposal of the materials. These problems were brushed aside in the EIR. given the "wait and see" approach.
What is the estimated impact of increased emissions steming from construction and demolition?,
How many buildings are expected to be demolished rather than upgraded ? How many new buildings are expected to be constructed?
What are the costs to the city ---increased payroll of clerical staff, inspectors, clean-up, loss of sales tax revenue?

Does the city have capable experienced seismic inspectors? How many? Were their qualifications verified?,The Rutherford report recommends that this is an area that needs a great deal of training of both seismic engineers and workman.
Does the City or Labor Organizations provide such training programs?
What is the availability of qualified seismic contractors, workman, engineers? Is the local labor pool sufficient or would outside workers be needed?

Reg: Seismic History of Ventura, Fault Evaluation,Potential for

After reviewing this question, no specific additional costs, obligations or expenses not already enumerated by the consultant were identified by the consultants. The EIR describes such possible costs based on comparative data from other cities.

The current water shortage does not have a bearing on water pressure in the City's municipal lines. Fire protection is based on pressurized flow and is independent of construction activities or requirements.

The Redevelopment Agency's goals and the upgrade effort now being considered are broadly compatible. In many cities, redevelopment agencies actively seek either to (1) demolish and replace unreinforced buildings (e.g., Long Beach, Salinas) or (2) to preserve, restore, and enhance their unreinforced masonry building stock (e.g., Sacramento). The Downtown Redevelopment Agency plans for downtown Ventura are more fully described in the recently certified Redevelopment Plan Amendment EIR. That Plan generally encourages preservation of the City's unreinforced building stock. The consultants are actively discussing how best to integrate the building upgrade with the Downtown Redevelopment Plan and Downtown Specific Plan with the Agency and other City consultants.

The use of asbestos "drop ceilings" in Ventura was not documented in detail. Generally, such ceilings were installed in structures to insulate or provide sound transmission reduction. Other materials were normally used for drop ceilings. The removal of a drop ceiling, incidentally, is a far simpler procedure than removing asbestos tiles that are attached to a wall or floor. Please refer to prior responses to this question for additional information. Note also that asbestos removal did not result in elaborate or costly problems in the comparable City of Ojai upgrade or in upgrades conducted thus far in Ventura.

Emissions associated with demolition cannot be computed with any accuracy until a level of upgrading is decided upon. Variations in construction activities, including potential for interior demolition work during strengthening, are fully described in Chapter 5 of the EIR. The number of buildings that may be demolished (based on comparative data) could range from as little as 1% of the building stock to about 7% if a relatively expensive upgrade is selected. A Level I upgrade would primarily affect ownerships that are highly leveraged. Refer to the expanded discussion of this issue in Chapter 11 of the Final EIR for additional information.

The availability of qualified contractors and inspectors is not a problem. Please refer to prior responses to this question.

earthquakes to occur in Ventura.

This is the single most conflicting-misleading- unfounded-undocumented portion of the EIR report as the report makes broad assumptions concerning the inevitability of a major earthquake occuring in Ventura and broad assumptions that various levels of strengthening will reduce loss of life proportionate to the level of upgrade that is adopted. In order to build a defense for this position the report relies on 2 scenarios and data extracted from the Loma Prieta earthquake.

From these assumptions the following questions arise.

What evidence is offered in the EIR that confirms that the history of seismicity of Ventura County is the same or similar to that of Santa Cruz, Watsonville or San Francisco?

Does the EIR verify or negate that Ventura County has not expeienced in the past 11,000 years activity or movement on any of the local faults that exceeded 4.7 magnitude?

Does the EIR verify or negate that Ventura County has had one earthquake in the past 100 years of a magnitude of 5.7 , the source of which is believed to be a fault off the coast of Pt. Mugu?

Does the report verify or negate that the Pt. Mugu did little more damage than a few chimneys fell in Oxnard.

Does the report verify or negate that Ventura County along with fifty other counties in the State has never had a fatality due to an earthquake?

What evidence is there in the EIR that Watsonville, Santa Cruz or San Francisco seismic history mirrors that of Ventura County?

The EIR reports that the Coalinga earthquake caused 13 fatalities. This is inaccurate--there were no deaths .

What authority has predicted that the Pitas Point fault is capable of a 7.25 earthquake?
What authority has predicted that the section on the San Andreas located in the north east corner of the County has been pinpointed as a likely candidate for an 8 or greater earthquake in the next 50 years? (The distance from Ventura of this section is 68 miles not 40 as reported in the EIR)

Tables on pages 2-25-2-36 Draft Appendix are not clear: Are the casualties estimated of the number of deaths expected to occur inside UMBs refer to total fatalities in all the buildings or each building? Or average of all the UMBs? Example: Table 2-27 ;under Fatalities .30 % of occupants in house or 195.450 total fatalities or does it mean approximately 1/3 life per building ?

Virginia Gould
Letter dated May 10, 1991
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The report states the probability of occurrence (within a margin of error) of various types of earthquake events. The commentor is incorrect in assuming that the model was "arranged" to derive a conclusion. A confident set of conclusions can be derived which link life safety and upgrade levels; it is far more difficult to establish clear linkage between degrees of building damage reduction and upgrade levels.

The seismicity of northern and southern California are broadly similar; the most frequently recurring earthquake source is common to both areas. There are obviously variations in named faults throughout the state; the critical variables relate to similarities in maximum credible earthquake strength and in the level of ground acceleration anticipated from the specific faults in the region. Additional explanation has been provided in the Final EIR (see revised Chapter 6 discussions).

The statement in paragraph 3 is incorrect. Refer to the revised discussion of the issue in Chapter 6. Information in the remaining paragraphs have been included in the Final EIR. See the revised discussion in Chapter 6.

There has been no event documented with a Richter Magnitude greater than 6.0 associated with the Ventura fault. However, a maximum magnitude of 7.25 was compiled in the CDMG database. In the ERTEC study, a magnitude of 7.5 was assigned, apparently to be slightly conservative. Using standard formulas [Reference 15] for thrust faults and a 50 km length:

$$\log_{10}(L) = 0.497M - 1.96$$

$$M = \frac{(\log_{10}(L)\ 1.96)}{0.497}$$

Using the formula for reverse slip faults:

$$M = 4.145 + 0.717 \times \ln(L) = 6.95.$$

Therefore, using a maximum credible magnitude of 7.25 is reasonable.

Regarding the distance from Ventura to the San Andreas, the distance to the 1857 rupture zone is about 60 km (or 40 miles). In the USGS Open File Report 88-398, this section of San Andreas from Carrizo to Mojave is described as having a 10-30% chance of generating an earthquake of magnitude 7.5 to 8.0 in the next thirty years. In the ERTEC study, a distance of 65 km was used.

Fatalities-street .04 of occupants on street 4.3 in each block, outside of each building ?
Whatever the figures represent they are meaningless if comparisons are not made--we live in a world of relativity. For instance does .30 (fatalities) mean relative to number of occupants at risk? Population at risk in Ventura in any location? Relative to total number of URMs? Relative to new buildings?

The EIR states Ventura has a 1% chance of an 7-7.25 earthquake occurring on the Pitas Point Fault within a mile of Ventura in the next 30 years Does this mean there is a 100% certainity that Ventura will experience this earthquake within 3000 years?

:
Thank you for responding to my questions and comments,

Virginia Gould

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Refer to responses provided on the previous page concerning the questions raised in these comments.

RECEIVED
MAY 14 1991
Dept. of Community Development
Planning
San Buenaventura

To: Peggy Woods
Planning Division
City of San Buenaventura

From: Thomas J. Wood
Ventura Realty Company
67 South California Street
Ventura, CA 93001
(805) 652-0277

Re: Written comments, EIR - 1468

Dated: May 13, 1991

In general, the environmental impact report is an information and planning tool designed to allow a public agency to determine whether the benefits of approving a particular project are greater or lesser than the adverse environmental effects that will result if the project is completed. This definition explicitly recognizes that the process involves a balancing by the public agency of benefits and adverse impacts.

With EIR - 1468, the "particular project" under consideration consists of a number of potential Unreinforced Masonry Building (UMB) seismic strengthening options. The "adverse effects" consist of anticipated short and long-term adverse changes in the physical environment as a result of the project, and, as developed in the EIR, the intensity and duration of these adverse environmental effects will be a function of the complexity of the particular strengthening option(s) ultimately chosen. The "benefits" to be obtained by approving a seismic strengthening program are succinctly stated to be reductions in the risk to life safety and loss of building stock in the event of a moderate to strong earthquake.

It is important to recognize that, up to now, the purported benefits, as defined, are qualitative abstractions which cannot be directly measured. It would therefore be extremely difficult, if not impossible, for the public agency to perform any meaningful balancing of benefits and adverse effects in the EIR in the absence of establishing and quantifying both the current risk to life safety and building stock and the effective reductions in risk corresponding to each of the various proposed strengthening options.

The EIR properly noted that any seismic strengthening program undertaken by the City must be viewed as an exercise in risk reduction rather than in risk elimination. It should be recognized that the term "earthquake-proof" is a misnomer and is

The comments in these three paragraphs recognize the significant predictive limitations that exist in predicting (1) future earthquake events, (2) the responses of building in the City, and (3) the degree of loss of life and injury that may result. Nearly all of the predictive statements in the EIR are probabilistic and subject to imprecision and measurement error; most cannot be further refined. Planning based on probabilistic outcomes is a necessary step when dealing with seismic design issues. This is unavoidable and characteristic of how such issues are addressed for new construction. Any model merely projects future outcomes to assist in planning a response. The model contains an approximation of future seismic conditions; the model can only predict using probability statements.

impossible to achieve in any practical sense; "earthquake-safe" is a misnomer, without a great deal of additional qualification of the term. The consultant also properly characterizes, in a qualitative sense, the increases in the level and intensity of adverse effects which would accompany the pursuit of progressively higher levels of risk reduction. In this way, it should be possible to compare the effectiveness of the various strengthening options in achieving what these purport to achieve.

It is likewise essential for this balancing process that the anticipated adverse effects be caste quantitatively so that these may be properly balanced against the benefits to be obtained. What would be left, ultimately, is largely the balancing process by the public agency of the benefits and adverse effects, and, for the reasons noted above, it is imperative that these elements be established and quantified. In this way, it would be possible for this particular EIR to accomplish its objective as an effective planning and information tool.

The California Environmental Quality Act (CEQA) and supporting case law impose some additional requirements on this process. CEQA requires that the degree of specificity to be required in an EIR should correspond to the degree of specificity involved in the underlying activity which the EIR describes. Here, as stated above, and it is important to note for reasons which will become apparent later, the underlying activity being considered is, in fact, the complete range of potential seismic strengthening options presented in the EIR, and not, as some might conclude from the EIR's various analyses, the hypothetical damages associated with a strong to moderate earthquake. It is further important to note that these strengthening options have been presented with a great deal of specificity, and that the Rutherford & Chekene Seismic Risk Model is touted as being building-specific. I would therefore observe that, in order to comply with the requirements of CEQA, the various analyses in the EIR should be required to exhibit a corresponding degree of specificity.

CEQA also requires that the EIR contain sufficient detail to enable those who did not participate in its preparation to understand and consider the issues in a meaningful way. The reason for this observation will become apparent in my discussion of the Rutherford & Chekene Seismic Risk Model. Further, an EIR can only be considered adequate if it is not based on bare conclusions and opinions; it must make findings of fact, and it

The consultants have attempted to quantify variables in all cases where such measurement is possible. Creating "false" quantities based on forced use of statistics, however, can be very misleading and can result in a "single number threshold" decision which fails to account for the complexity of a decision. The consultants have deliberately continuously urged caution in the interpretation of statistics and numerical summaries in this EIR. Such statistics are only <u>one</u> source of information made available for consideration by the decision makers. Deciding what level of strengthening to adopt is a judgment which requires consideration of a broad range of often contradictory findings.

The degree of specificity employed in the Seismic Risk Model and the relation of the decision-making process to the model results have been discussed in responses and in additional responses to follow. Refer to these responses for additional discussion.

The reiteration of CEQA goals in the latter two paragraphs of this comment is acknowledged.

must discuss the findings and indicate the evidence and the reasoning relied upon in making the findings. The EIR must disclose the data or evidence upon which the persons conducting the study relied; mere conclusions without the supporting evidence will be considered insufficient. CEQA also imposes a clear requirement that the public agency will have the burden to show affirmatively that it has considered each of the factors applicable to each identified adverse impact, and all feasible alternatives and mitigation measures, and it must explain its conclusions with express findings supported by substantial evidence in the record.

Against this backdrop of general observations, my comments herein with respect to EIR - 1468 are generally broken into three areas: 1. The shortcomings associated with the Rutherford & Chekene Seismic Risk Model; 2. The misuse of the risk estimates in the EIR; 3. General observations; and 4. Closing remarks.

1. Rutherford & Chekene Seismic Risk Model.

The Rutherford & Chekene Model, and its predictions, comprise the bulk of the risk assessment evidence in the EIR

I begin my discussion of the Rutherford & Chekene Seismic Risk Model by noting that the Model and its estimated results form the basis for the bulk of the evidence (and the conclusions) presented in the EIR, with respect to the assessment of the risk currently posed to life safety and building stock by Unreinforced Masonry Buildings (UMBs) in the City of Ventura. The Model and its results also form the basis for most of the evidence regarding the effectiveness in risk reduction of the various strengthening options. The Loma Prieta "evidence" presented in the EIR is truly not that at all. While it purports to present some "evidence" concerning the types of damage to be expected in a moderate to strong earthquake, there are obvious internal consistencies in the data with respect to the evidence it provides concerning the effectiveness of various strengthening strategies. Furthermore, since the measures under consideration in this EIR revolve around risk reduction, evidence concerning the "effectiveness" of various strengthening measures logically can provide no help in the assessment of the magnitude of the original risk in the absence of these measures. The other

The supporting evidence documenting the EIR findings is specific and comprehensive. It is important to distinguish between what is termed evidence and the use of a model to predict future conditions. The model used in the EIR is the same predictive model that has been used to describe future seismic effects in San Francisco, Santa Monica, and Oakland.

The computer model uses accepted seismic risk analysis and structural analysis methodologies to estimate seismic losses under different conditions. Similar methods have been used on single buildings without the convenience and speed of a computer for over twenty years. Other than combining several procedures into a single computer program, the model should not be considered as new technology. Although specific features pertaining to URM buildings were developed of the study of San Francisco buildings, the basic calculation steps and procedures are applicable statewide. These steps, and authorities for their acceptability, include:

1. Identification of seismic sources (U.S. Geological Survey [USGS]; California Divisions of Mines and Geology [CDMG]).

2. Change of ground motion with distance from source (attenuation) (USGS).

3. Estimation of damage to buildings from different ground motions (References. 1, 4, 5).

4. Seismic risk calculations (Reference 3).

The technical details of calculations and assumptions used in the model are contained in the Technical Appendix (Rutherford & Chekene's Final Description of Procedure and Results).

The characteristics of buildings in Ventura were specifically considered in the analysis. Comparison to buildings in San Francisco were made only to assure consistency in damage estimation. The model used in the study, including seismic sources, soils conditions, building inventory, and damage characteristics was developed solely for Ventura and was intended to roughly characterize the overall level of risk, and to compare alternate actions.

Significant statistical analysis has been performed on Loma Prieta damage data from nearly 2,000 URM buildings since the San Francisco and Ventura studies were completed (Reference 6). Several parameters used in the studies for both San Francisco and Ventura were confirmed by these analyses. First, the rough, initial calculation that strengthened buildings were less damaged than unstrengthened buildings was confirmed. Also, the observation that tall stories and soft soils increased damage was confirmed. Most importantly, the relative damageability of various unreinforced building types was confirmed; the order of damageability used in the San Francisco and Ventura studies, originally deduced from observation, theoretical dynamic response, and structural calculation, was confirmed almost exactly by Loma Prieta data. The damage data were analyzed to find the best statistical grouping of building prototypes.

specific "evidence" presented in the EIR concerns estimates of the actual "population at risk". This topic will be discussed later.

The Model Dissected

Consequently, a large part of the EIR is preoccupied with the notion of developing and justifying a computer model to estimate (and thereby establish and quantify) the risks of death, injury and property damage, without strengthening and under several strengthening scenarios, in the event of a moderate to strong earthquake.

A review of the Model's documentation contained in the Technical Appendix of the EIR immediately discloses some serious problems, with 1. the reliability and suitability of the Model's overall structure; and 2. its reliability as applied to the particular risk assessment under consideration. A third set of serious problems deals with the way the Model's results were used in the EIR; these will be discussed in a separate section.

General Structure and Suitability

The Seismic Risk Model was developed specifically for the conditions found in the San Francisco Bay region. It was 'completed' recently in April 1990, and the documentation fails to disclose whether it has ever been subjected to any rigorous testing to determine either its predictive accuracy or its utility outside of the San Francisco Bay region. There are no standard statistical analyses accompanying the documentation which would reflect the reliability of its structure. Admittedly, its derived relationships were tested against the Loma Prieta earthquake for "fit" to damages actually observed, but the "fit" of the model to one event (after the fact) cannot be considered by any scientist as statistically significant and certainly not adequate to demonstrate the general utility of the Model. Further, there is no indication that the Model has ever been used and verified predictively to date.

The degree of specific damages to a specific building or group of buildings resulting from an earthquake is a function of a complex interplay of factors, which include but are not necessarily limited to the following: the

This analysis suggested four groups, where the study used five, but otherwise the order of damageability was identical to that used in the model. The first column below shows the statistically generated groupings by prototype; the second column shows the damageability grouping used in the studies; and the third column shows the average damage of each group.

LOMA PRIETA EARTHQUAKE DAMAGE

STATISTICALLY BEST GROUPING OF PROTOTYPE BY DAMAGEABILITY

Statistically Significant "Best" Grouping of Prototypes by Damageability	Damageability Grouping Used in Studies Least Damage = Group 1 Most Damage = Group 5	Average Damage in Loma Prieta
A	1	
D	1	
G	2	2.0
L	2	
M	2	
N	3	
B	2	
C	3	3.4
H	3	
I	4	
D	4	
E	4	5.1
J	4	
O	5	
F	5	7.3

In addition to estimating losses from certain specific earthquakes of interest, probabilistic losses (probable annual losses) are estimated in the Ventura study. Although caution is advised with the use of annual loss results (probable losses per year over a long period) without consideration of consequences of a large single event, probabilistic analysis is the most valid method of comparison of alternative actions. Although it is often impossible to exactly predict the outcomes of technical decisions, probabilistic calculations have long been used to compare alternative actions in automobile and aircraft design, fire safety, and health legislation.

construction type of the structure taken together with the structure's size, shape, particular design, and current physical condition; the duration and intensity of the various wave forms generated by the specific earthquake; the distance of the building to the earthquake's location; the particular soils conditions beneath the building under consideration; and the particular geologic structures intervening between the building and the earthquake's location. The computer model purports to take into consideration some of these listed parameters, but others are wholly disregarded or given assumed values.

Clearly, simplification of the parameters may result is an easier Model to construct, but the risks of over-simplification are too great to justify cutting corners. I am not satisfied with the purported statistical materials demonstrating correlation supplied in the documentation for the Model. However, even if the statistical materials presented are considered adequate, and, especially in the absence of sound statistical analysis demonstrating a significant correlation to observed facts, the documentation should reflect the supporting rationale for each instance that the Model neglects to take a variable parameter into consideration or supplies an assumed value.

The Model, as presented in the Technical Appendix, should be put into a proper context. It is too new, too untested, and too statistically unverified to be considered anything but a theoretical construct at this point. As will be seen, this view is reinforced by the fact that, for purposes of the Ventura study, Rutherford & Chekene were compelled to supply a great number of highly subjective assumptions. Obviously, any inaccuracy in the values chosen for these assumed model parameters could yield highly unreliable risk assessment results, and these effects would be amplified cumulatively if several highly subjective and possibly inaccurate assumptions were made. Unfortunately, no mechanism has been supplied or suggested to test whether the use of each of these assumptions has resulted in inaccuracy (a decrease in reliability) for the Model's risk assessment results.

It is recognized that there is a wide variation in performance of structures in earthquakes. However, as the number of buildings considered is increased, the variation in overall results decreases. The variation in estimated damage for any given building may be as much as 300%. The reduction in variation is roughly proportional to the square root of the number in the sample; for about 150 buildings, this variation should therefore be reduced to about plus or minus 25%. This magnitude of variation would not void use of the methodology. Systematic errors (errors in establishment of calculation parameters), on the other hand, would affect all alternatives similarly and would therefore not affect comparisons. To minimize the chance of systematic errors, overall results of various scenarios have been checked against comparative historical events for the San Francisco, Ventura, and Santa Monica studies and found to be reasonable. Therefore, for the stated purposes of establishing the overall risk level and for comparing alternative actions, the SRM methodology is acceptable and appropriate.

Problems with the Model as applied to Ventura

Rutherford & Chekene considered event scenarios with the following assigned probabilities:

Pitas Point-Ventura Fault: 7.0 magnitude, with a chance of occurrence of less than 1% in the next 30 years; and

San Andreas Fault, (some confusion over magnitude) with a chance of occurrence of 30% in the next 30 years

No scientific basis or source is presented for the particular assignment of the above probabilities. It is sufficient to state here that there is considerable disagreement among experts with respect to the assignment of such probabilities to these events, and the scientific literature is replete with examples of conflicting methodologies and assignments, with supporting data. The assignment of these particular probabilities constitutes the first of several suspect assumptions made in the Model.

Furthermore, throughout the discussion of the Model in the Technical Appendix and in the EIR, a potential event on the San Andreas Fault is considered to be the most likely to occur (with an unsubstantiated, but stated, 30% chance of occurrence in the next 30 years). However, at various points in the Technical Appendix discussion and tables presented, it is not clear whether what is being tested is a 7.75 magnitude event (page 2-16), an 8.0 magnitude event (tables on pages 2-27 through 2-30), or an 8.3 magnitude event (page 2-19), and to what extent these obviously differing magnitudes would affect the Model's risk assessment results reported and relied upon in the EIR.

Other troublesome areas consist of expressed limitations and unexplained (hence unwarranted and therefore deficient) assumptions, such as:

At page 2-1 (Overview of Procedure), Rutherford & Chekene state: "**Both the estimation of intensities for any event and the expected damage can have large variations.** For this study, both have been taken to be average values." (Emphasis added). No supporting rationale is given for the assumption of average values given the fact that large variations can occur. Just as importantly, the statement is

Because of increased public interest and concern about potential loss from future earthquakes in California, the National Earthquake Prediction Evaluation Council recommended that the probability of occurrence of large (magnitude 7 or greater) earthquakes in California be evaluated. USGS Open File Report 88-398 is the result of the study on California Earthquake Probabilities. In this study, the evaluations were based on a probability model that assumes an increase of probability with elapsed time since the previous major earthquake on the fault segment. Based on this study, the San Andreas fault systems in segments Carrizo and Mojave could generate an earthquake of Magnitude 7.5-8.0 with a 10-30% chance in the next 30 years. Stanford University (Reference 14), based on the historical records of 255 events, has predicted that there is a 22% chance that there will be an earthquake greater than 7.75 in the same time period. This is similar to USGS Open File Report 82-1033 (Reference 13). In CDMG compiled data (References 7, 8), the maximum magnitude for this segment is 7.75. The actual model used for the Ventura study has two segments of the San Andreas Section with maximum magnitudes 8.0 and 7.75 respectively. The computer maximization routine picked the segment with Magnitude 8.0. Hence the actual scenario used in calculations was a Magnitude 8.0 on the San Andreas.

a strong indication that there is a strong element of **unreliability built into the Model.**

At page 2-16 (Site-Specific Modification to Damage-Intensity Relationships): "Many attributes were considered for use, **but little data exists that can be used to rationalize quantitative effects on damage.** The modifications used, and described below, are not believed to be qualitatively controversial. **The sizes of modifications used are largely undocumented and judgmental.**" (Emphasis added). The risk assessment results of the Model comprise the bulk of substantial evidence in the EIR record with respect to the estimates of the current magnitude of the seismic risk to life safety and building stock. In view of the need of the consultant to rely upon these risk assessment results of the Model in reaching substantive conclusions in the main body of the EIR concerning the effectiveness of the various strengthening options and alternatives, and most importantly, in making recommendations, it would appear to be preferable by far to supply data which is missing rather than to base conclusions on largely undocumented and judgmental opinions.

Each of the Model modifications is replete with assumptions which, because these are largely unexplained and undocumented, are not demonstrated to have any legitimate basis in scientific fact. Soils classifications and liquefaction potentials were taken from the Seismic Safety Element of the General Plan for the County of Ventura and are too highly generalized to yield accurate results when used with other model parameters which are building-specific. The documentation for the Model and the EIR discussion touts the Model for its particular utility in building-specific risk assessment. Using generalized data adds another loss of resolution to the Model and constitutes another built-in component of unreliability.

With respect to the several strengthening conditions tested in the Model, some do not even correspond to the strengthening options under consideration in the EIR. The fact that these may be approximations to options under consideration will only reduce the size of the unreliability component introduced into the Model.

The USGS study does not cover the Ventura fault. In 1985, ERTEC did a Seismic Hazard Analysis of Ventura in which it was predicted that the city will experience 0.28g ground motion with a return period of 600 years. It also pointed out that the Magnitude 7 event on the Pitas Point-Ventura fault will produce 0.7g ground motion in Ventura. It can be inferred that such an event would have a return period of at least several thousand years. In our study, we adopted the Stanford research result based on historical records. The return period for a Magnitude 7.0 event is about 5,000 years. It is recognized that there has been no big event recorded in history on the Ventura fault. The 1% in 30 years is used to indicate that seismicity is relatively low for the Ventura fault.

2. The Misuse of the Risk Estimates in the EIR Analyses.

The dangers inherent in the use of probabilities, and computer modeling lie in the fact that the use of any Model, together with the results that it produces, can be packaged to resemble sound reliable scientific fact, when, in fact, the results produced may be far less reliable than the individual data and assumptions which go into the Model. From a statistical viewpoint, the limitations inherent in this Model may preclude results which would be even considered relevant to the environmental analysis under consideration.

In the discussion of the Model by Rutherford & Chekene in the Technical Appendix, each of the Tables presented on pages 2-27 through 2-36 carries the following legend: "These data should not be reproduced or used in any way without consideration of the limitations in accuracy as discussed in the balance of this report." The term "limitations in accuracy" takes two forms with respect to the risk estimates produced by the Model and used extensively in the EIR. The first form deals with the potential shortfalls in the structure of the Model, while the second is related to the particular assumptions made with respect to the Model's data inputs for the purposes of creating the risk assessment results for this particular EIR. The term "balance of this report" means the various points in the documentation where Rutherford & Chekene state what assumptions they are making without explaining their rationale for making those assumptions. Part of the explanation should consist of the expected effect on the Model of making the particular assumption.

The Rutherford & Chekene disclaimer does not appear with respect to the Tables presented in Chapter 7 of the EIR, and appears, to the best of my knowledge, nowhere else in the EIR. The fact is, it was not possible to find any meaningful discussion or explanation of the limitations in accuracy of the Model in the body of the EIR. Consequently, so that the appropriate "weight" can be attached to the reliability and accuracy of the risk assessment results of the Model, it is essential, at the very least, that the limitations associated with the Model be carefully noted and applied whenever there is any discussion in the EIR which refers to, or more importantly, relies on, the risk assessment results of the Model. As will be observed below, at a number of points in the EIR discussion, the

Using the Seismic Risk Model to predict future earthquake risks is a resonable method for engineering structural reinforced programs. The accuracy and applicability of the model is fully defended in preceding responses. The predicted error margin in the results has also been computed. Refer to revised sections of the EIR concerning the Model and its interpretation.

consultant totally fails to qualify the conclusions reached and recommendations made with respect to the "limitations in accuracy" of the Model.

At page 2-1 (Technical Appendix, Overview of Procedure), Rutherford & Chekene state: "Since a major earthquake could occur at any time and skew short-term accumulated losses, annual loss results can be misleading if interpreted literally." This statement implies equally well that a major earthquake could also skew expected long-term accumulated losses--if the Model's risk assessment results are not accurate. This quote also implies equally well that it is not appropriate to report the estimations of risk in a manner which begs for literal interpretation. Nevertheless, the Model's risk assessment results are presented in a literal manner at a number of points in the EIR analyses.

The failure to consider the "limitations in accuracy" associated with the Model is prevalent in the various EIR discussions concerning the identification and mitigation of adverse impacts, and, most importantly, with respect to the consultant's analysis of alternatives, conclusions and recommendations relating to the various options under consideration. The failure to fully discuss the Model's limitations in detail is improper and derives directly from a failure to present the Model and its results in the context and in the manner intended by Rutherford & Chekene.

As demonstrated in the discussion on page 12-2, a blind reliance on the Model's estimates of risk can result to the unbelievable situation where the anticipated damage effects of a strong to moderate earthquake are referred to as "substantial adverse effects" and have somehow become cloaked in the discussion with environmental analysis terminology, while with respect to the adverse effects associated with the project under consideration, these are merely referred to as "predicted effects".

This is no isolated mistake on the part of the consultant. It is representative of a bias or tendency prevalent in various sections of the EIR supporting a subtle reversal of relative emphasis whereby the damages anticipated to result from a moderate to strong earthquake being modeled become caste as certain to occur, while the significant adverse effects associated with an extensive seismic strengthening program are

Regarding the conclusion made by the commentor in paragraph 5, it is important to remain focused on the project under consideration which is the adoption of some form of a seismic strengthening program. The EIR does not extend beyond the typical use of predictive models and the limitations in the model are not ignored. Models are educated approximations of future conditions; they are not inviolate predictions. However, the use of a model (and scientific procedures in general) are considerably better predictors of future conditions than random guesswork or wishful thinking. The EIR does consider a "no project" option which could potentially result in significant damage to downtown Ventura. Another possible "no project" option outcome would be a long period of seismic quiescence. Given these two possible outcomes, it is reasonable to plan for conditions which could cause serious damage to the City's economy and building stock. Such an approach is not only scientifically reasonable and justified, it is common sense. Nonetheless, both possible "no project" outcomes are now discussed in the Final EIR.

reduced to a statistical possibility. The reliance by the consultant on the Model's risk assessment results "as facts", and the presentation as such, improperly colors the discussion of alternatives and acts as the overriding justification for the consultant's recommendation of certain of the more stringent strengthening options (to the extent of advocating that the City adopt strengthening standards to counter a catastrophic event with a 1% chance of occurrence over the next 30 years.)

This subtle bias is also apparent in the analysis concerning anticipated adverse impacts. In Section 10.2 on Page 10-1 of the EIR, the discussion states: "It is neither necessary nor useful to quantify the number of businesses or residents that would be subject to each type of potential construction impact that would result from each type of strengthening." Implicit in this statement would seem to be that it would not be informative, except in a generalized qualitative sense, to know the number of businesses impacted and the degree to which each of these would be impacted by the various strengthening options. It is useful to remember the degree of specificity requirement of CEQA and the fact that the Seismic Risk Model is touted as capable of building-specific assessment. In fact, a portion of the data input into the Seismic Risk Model was building-specific. In addition, since the objective of the EIR is to be a good information and planning tool by allowing a balancing of benefit versus adverse effects, it would seem absolutely essential that the adverse effects be quantified--just as the risk assessment attempted to accomplish.

Additional support for this view comes from the potential worst-case consequences of permanent business dislocation given the cumulative construction effects of a stated 6 to 20 week strengthening project (Level III Project Duration, EIR, Page 5-47). That section also states "With occupancy maintained, the work period is usually about twice as long as conditions without occupancy". These time estimates on the face of the EIR, make it all the more extraordinary that any of the construction effects could be characterized as "temporary".

Because the consultant makes conclusions and recommendations in the EIR, largely based on the risk assessment results of the Model, it is essential that a proper focus be maintained throughout the logical framework of the EIR. A hypothetical earthquake is not the "project" properly under consideration in the EIR, and earthquake-related damages

It is important to stress again that the consultant has presented a very broad range of alternatives for consideration. The identification of the environmentally superior option (required by CEQA procedures) may not necessarily be the economically superior option, especially from the perspective of building owners. The Final EIR recommendations have been revised to take into account both environmental and economic factors. This could not be done in the Draft EIR because specific information about the economic viability of downtown building owners was unavailable. The statement to which the commentor has objected has been rewritten to improve clarity of meaning.

The construction effects of the various upgrade programs vary widely and, as explained in the EIR, in considerable detail. Considering the effective economic life of the buildings under discussion, construction episodes ranging in duration from several weeks to several months are appropriately termed as brief. Given the average age of the present building stock and assuming and additional economic life of 25 to 35 years without further significant maintenance or rehabilitation, the construction disruption represents a very brief period (.0003% of total building life). The investment of so brief a time period in building maintenance cannot reasonably be characterized as a period of long duration. However, even the short term economic effects on building tenants could be relatively severe (as documented in the Final EIR). For this reason, an alternative has been added which would require upgrades at change of occupancy or sale of a building. Refer to the revised EIR Alternative Analysis for an expanded discussion of various alternatives.

predicted by the computer Model are not the "adverse environmental effects" under consideration to be mitigated. It is additionally important that all discussions bearing on the Model's risk assessment results be carefully and properly qualified with the Model's "limitations in accuracy".

3. General Observations.

Population at Risk Estimates.

At page 2-18 (Technical Appendix, Damage-Casualty Relationships), Rutherford & Chekene state: "Casualty rates for earthquakes have generally been estimated for the entire population at risk. Analysis and use of actual data must be on that basis because casualty data is not available per building type or on the basis of actual number of occupants per building." At 2-19: "The population inside UMBs was calculated using square footage, building uses, and probable occupancy loads obtained from Ventura. The population outside UMBs was calculated using lineal feet of exposure per building face and population densities for various open area conditions estimated by the Planning Corporation of Santa Barbara. Resulting exposure are shown in Table 8." There is no Table 8, but Table 7-1 in the EIR is assumed to be identical. The basis stated for the estimation of population densities for inside UMBs is a highly overstated and speculative figure for downtown Ventura (i.e. 10 occupants / 1000 square feet commercial). The basis ("pedestrian count data obtained during peak weekday exposure hours", stated on page 7-13 of the EIR) for the estimation of population densities outside UMBs is not qualified as to details of terms used, location(s), date(s), time(s), and methodology to allow evaluation of scientific accuracy versus the consultant's bare opinions. Furthermore, since Table 7-1 does not sum up the total population actually at risk, it is virtually impossible to test its assumptions.

The consultant recommends a more stringent level of strengthening for the Main Street Corridor than for UMBs in other parts of the City, partially because of the heightened "risk" posed to increased pedestrian traffic and higher occupancy loads, as well as because of the extensive contiguous placing of UMBs. Certainly, further details should be provided in the EIR with respect to comparative population density studies (especially

Building occupancies and exposure rates were developed to provide an estimate of project effects of the long term; the exposure rates were not intended to be predictors only for the year 1991. However, it is important to use some established baseline so future comparisons of seismic risk (to conditions estimated for the present) can be made without mere guesswork. Therefore, pedestrian exposures, for example, were developed by performing a sequence of counts along Main Street between Figueroa and Chestnut. The counts were performed every quarter-hour along this street by teams of individuals. All persons on a street segment within a one-minute period were counted; counts were performed from about 11:45 to 1:15. The peak period exposure was based on observations provided by City staff. Double counting was avoided by having each counting team member survey only one side of the street during an approximate one-minute interval. Using this procedure, compared to statewide averages and typical retail areas in southern California, the pedestrian counts for Ventura (per 1000 lineal feet) were very low (which in turn reduced the hazard exposure for pedestrians).

The recommendation to use a higher upgrade standard in the downtown area is a reasonable and logical approach to the upgrade problem if such a program would not have unmitigable economic effects. Further pedestrian and occupancy exposures are projected to increase through time as the Specific Plan for Downtown and the Downtown Redevelopment Plan are implemented.

with respect to pedestrians) which would help to justify the conclusion concerning a higher population at risk.

Comparative Data from Seismic Strengthening in Ojai.

With respect to the use of comparative data from seismic strengthening projects in Santa Barbara and Ojai to discern construction effects, the consultant has recognized that there are inherent difficulties in comparing either of these markets with Downtown Ventura, due to the fact that both Ojai and Santa Barbara possess far more vigorous and aggressive economies in their downtown areas than does Ventura. The consultant has further recognized that the Arcade project in Ojai was an extremely difficult experience for a number of the tenants there. However, a review of the figures cited for Ojai may indicate that the problem was considerably worse than reported by the consultant in the EIR. Ojai Valley News newspaper accounts of the Ojai Arcade project have indicated that there were 24 tenants in the Arcade during the strengthening project. In the EIR, only 17 Arcade tenants are listed; it is stated that 13 of these provided detailed responses to a survey questionnaire, and 16 business owners were interviewed. In short, the survey and interviews, which were performed long after the completion of the Ojai Arcade project (and certainly after any businesses which failed had already left), may only represent 54% (13/24) to 66% (16/24) of the total tenants in the Arcade during the project. The surveys and interviews would therefore be skewed in favor of those businesses which, despite the hardships reported, had somehow survived. In addition, it is nearly impossible to reconcile certain of the statistics reported on page 10-7 which appear to conflict (e.g., no business had more than a one month loss of revenue; however, nearly 80% of the business tenants experienced income reductions of at least 50% below normal volumes and revenue losses ranged from a 20 to 80% reduction for the months of concentrated upgrade work). For the record, the Arcade project resulted in the tenant hardships reported in the EIR and took nearly seven months to complete, despite the active participation of the City of Ojai in construction coordination and funding.

This paragraph reiterates some of the findings in the EIR and generally concurs with the EIR description of tenant effects. The Arcade project was somewhat structurally more complex than a Level II upgrade program would be for downtown Ventura. The revised EIR text in the construction effects chapter describes the program in greater detail. The discrepancy between the number of tenants present at the outset of the upgrade program and the number of tenants interviewed may have several explanations. However, these discrepancies are not particularly important since the size of the sample (from a standpoint of statistical sampling) is very large in relation to the affected population. The City of Ojai did not take exception to the accuracy of the conclusions regarding tenant disruption. The data are considered representative of tenants' problems resulting from a Level II or III upgrade. Comparable anecdotal information was obtained in Santa Barbara and interviews with tenants in Ventura (now included in the Final EIR) substantiated the conclusions in the Draft.

4. **Closing Remarks.**

To sum up, it is my strong opinion that the conclusions, recommendations and discussion of alternatives in the EIR are seriously tainted with a bias stemming from an over-reliance on the results of the Rutherford & Chekene Seismic Risk Model. The bias is the natural product of accepting the predictive risk assessment results of the model without qualifying these predictions with the rather substantial limitations Rutherford & Chekene placed on the use of the Model. Rutherford & Chekene admittedly were compelled to make a number of highly subjective assumptions concerning input into the Model. In view of the reliance which the consultant placed on the predictive results of the Model evidenced in the various discussions in the EIR, it is possible, and preferable, that data be collected for input into the Model to replace as many subjective assumptions as possible. This would help to insure results with a far greater assurance of reliability. As constructed, and in view of the theoretical nature of the Model (especially as applied to Ventura), it is currently virtually impossible to test any of the predicted results for reliability. In addition, some of the data, such as the population at risk estimates are stated in the EIR without any methodology allowing verification, but appear to be highly overstated, based on familiarity with downtown Ventura. In addition, if there is evidence in the literature with respect to the chances of occurrence assigned in the Model for the modeled earthquake events on the Pitas Point Ventura Fault and the San Andreas Fault, this information, as well as contrary viewpoints of qualified experts, should be included to provide support for the assumptions made. With respect to geological conditions, soils classifications and liquefaction potential classifications, it is my contention that if building specific parameters are otherwise employed in the Model, that these parameters should also be as specific as possible--and far more specific than the information contained in the Seismic Safety Element of the General Plan for Ventura County. Otherwise all of the detail and resolution afforded by the building-specific parameters in the Model is potentially lost in the variability of the more general parameters. If all of that specific resolution is not necessary, then the question must be asked as to why this particular Model was even employed, since its strong point is its potential site specificity.

Once the Model is reconstructed with more reliable

The Alternatives analysis has been rewritten to take into consideration considerable economic information about downtown Ventura tenants which was unavailable when the Draft EIR was prepared.

The EIR relies on every legitimate form of investigation regarding earthquakes: historic data, comparative experiences, simulation (the computer model), recurrence interval predictions, averaged probabilities, risk assessment, cost-benefit evaluation, and common sense. The reliance on the computer model is primarily an attempt to quantify future conditions without being unrealistically vague and imprecise. As explained in prior responses, the model (as tested by the Loma Prieta experience) has been validated as an accurate predictor of future effects <u>once</u> an earthquake occurs. The model cannot (nor can any model, except as probability estimates) say <u>when</u> an earthquake will occur within a specific time frame. Earthquake predictors (recurrence intervals) are probability statements. With regard to the statement that it is not possible to test the model for reliability, the Loma Prieta provided a test of the model's effectiveness as a predictor and the model outcomes and actual effects had an excellent fit.

Soils data which was unavailable at preparation of the Draft has now been included in the Final EIR. Conclusions have been revised accordingly.

information, the new predicted estimates of risk should be re-submitted, complete with detailed discussion of the Model's limitations and assumptions, together with a statistical analysis supporting the reliability of the Model. It would then perhaps be possible in this context to accurately discuss significant, and potentially significant, adverse environmental impacts (stemming from the project, of course), mitigations and alternatives without an apparent preconception of overriding considerations.

I make these final observations largely because, to reiterate some of my initial remarks, CEQA and its body of case law impose a clear requirement that the public agency will have the burden to show affirmatively that it has considered each of the factors applicable to each identified adverse impact, and all feasible alternatives and mitigation measures, and it must explain its conclusions with express findings **supported by substantial evidence in the record.** (Emphasis added)

Thank you for the opportunity to respond to this EIR.

Sincerely,

Thomas J. Wood

The reliability of the model has been discussed in the Final EIR and in prior responses to comments. Further explanations are unnecessary. The balance of this comment is acknowledged.

RECEIVED
MAY 09 1991
Dept. of Community Development
Planning
San Buenaventura

To Peggy Woods
City of San Buenaventura
Planning Division
POB 99
Ventura, California 93002

Re: Comments on Draft Environmental Impact Report
Proposed Unreinforced Masonry Ordinance
City of Ventura Community Development Department
and
Technical Appendix, Unreinforced Masonry Environmental Impact Report, for City of Ventura Community Development Department
(March 1991, The Planning Corporation of Santa Barbara)

Re: Appendix, 2-1. There appear to be major omissions to this report by Rutherford & Chekene that purports to explain the applicability of computer modelling to Ventura's URMBs (Unreinforced masonry buildings):

In the absence of actual historic records of fatalities and building damage, why is computer modelling an adequately valid substitute for actual field experience in identifying risk?

Where are the peer group citations in the subject literature that confirm that computer modelling successfully predicts earthquake fatalities and damage?

What is the field record (under actual earthquake conditions) of this computer model in actually predicting quake fatalities and damage?

Why is PGA (Peak Ground Acceleration) converted only "to projected Modified Mercalli Intensities (MMI)"?

Is it not standard practice among seismologists to also include a comparison with the Richter scale magnitude (RM) in such reports?

Isn't MMI virtually a subjective measure, subject to human opinion and frailty as to validity?

In seismology, hasn't RM overwhelmingly become the prevailing standard of energy measurement (because force and amplitude can be directly quantified from field instruments)?

"Descriptions of [MMI] are common in the literature and will not be repeated here." Why not? Why does the assertion that something is common constitute an adequate excuse for omission? What evidence shows that descriptions of MMI are so common that they are readily available to the lay reader? Or were MMI descriptions (definitions?) omitted because inclusion would have revealed that the measurement is one that rests largely on the

Andrew Chakires
Letter dated May 8, 1991
Page 1

The accuracy and reliability of the model has been explained in responses to prior comments. Please refer to these responses and to the Final EIR revised summary for an explanation of the inadequacy of historic data only as sufficient predictors of future effects. The "field record" of the model is also summarized in prior responses.

The MMI scale is an ordinal scale measurement system (unlike the Richter scale which is an exponential-interval scale based on recorded measurements) with wide applicability. It is particularly useful for estimating earthquake intensity where no instruments are situated to record motions and to reconstruct the intensity of historic quakes. It is the most useful ordinal scale calibration of earthquakes currently in use. A scale comparison chart has now been included in the EIR Technical Appendix. A brief explanation of earthquake measurement scales has also been included in Chapter 6.

subjective opinion of a human observer? In the very least, why couldn't a description of MMI that appeared on page 175 of the August 1972 California Geology have been included?

More importantly, shouldn't the writers have revealed the prevailing consensus of opinion of the professionals and experts in this field as to which of the two (or a weighted combination) is the preferred method of measurement?

"A detailed description of SRM is contained in Appendix 1." Where in the two bound reports is this?

As to the next paragraph, "casualties were estimated . . . The population . . . varies a great deal with time of day. An algorithm was developed . . . "
What is the average population and its standard deviation? Where is the algorithm itself?

In general, why isn't the complete data base that was inputted into the computer disclosed here? Why isn't the complete program, together with application language (if any) used in the "computer modelling" study disclosed here? Also, the make, model, peripherals and their specifications, as well as relevant configurations, of the computer(s) employed for this SRM do not appear in these reports. Neither a complete printout or output on magnetic media of the computer model is readily available to the public. Why?

2-8 (mid-page) "somewhat comparable". Couldn't a reasonable attempt have been made to quantify the two specifications so as to promote valid comparisons in a more objective manner, rather than depend on personal opinion?

2-16. Pitas-Point-Ventura fault: risk for a 7.0 (Richter Magnitude) event is "less than 1% in the next 30 years". Doesn't this mean that the average annual risk is but 0.000333? Is this a significant risk in terms of public safety?

What is the threshold of sensitivity for unacceptable risk for the public so exposed? What data supports such a ratio? What data supports this standard? What is the basis for the 7.0 prediction? Is this fault instrumented?

Why such concern for a 7.0 RM in the first place? Does not a review of the table on page 21 of "Final Report on Damage to Unreinforced Masonry Buildings in the Loma Prieta Earthquake of October 17, 1989" by Rutherford & Chekene themselves ('90, CA Seismic Safety Commission, Sacramento, CA) compel even a reasonably educated reader to conclude that retrofitting's efficiency in a 7.1 is highly questionable for URMBs located up to 60 miles from an epicenter?

Where then is the conclusive evidence that retrofitting would be fully effective if a 7.0 (RM) shake originates less than just a

The Technical Appendix for the Seismic Risk Model is very clearly identified in the EIR Volume II.

No page or paragraph references are provided in paragraphs 3 and 4, so preparing a response to specific comments is not possible. The Technical Appendix for the Seismic Risk Model contains the mathematical details sought by the commentor. The data base (hard copy printout) used in the model is included in the Final EIR Technical Appendix.

References to pages 2-8 and 2-16 in the Technical Appendix: the degree to which specific fault hazards constitute public risks is now discussed both in technical and nontechnical language in the Final EIR. Refer to the revised EIR summary and additional text included in Chapter 7. Refer to responses provided by Rutherford & Chekene to the technical questions raised in paragraphs 7 through 10. The issues raised by these brief paragraphs concern the design standard to be used in implementing a strengthening program. This issue is now discussed in considerable detail in the Final EIR summary.

/

mile from downtown?

Why is it implied that the epicenter of a 7.75 RM event within the next 30 years will be but about 40 miles away, when in fact the best prediction for such a "Big One" stems from a 1988 symposium of experts sponsored/attended by U.S. Geological Survey/Cal Tech whose consensus held for the epicenter to be some 50-100 miles East of Palm Springs in the mean year of 2018?

Where in any of these two volumes is stated the normal attrition rate of these URMBs? If left alone, how many of Ventura's URMBs will be lost annually to fire, to the exigencies of old age, to voluntary demolition, etc.? Thus how many of Ventura's URMBs can be expected to be standing in the year 2018?

2-18 (page bottom) ". . . casualty data is not available per building type or on the basis of actual number of occupants per building." Is this not an admission that no definitive case against the URMB has been presented to justify any need for a retrofit ordinance? Why wasn't this stated in the EIR itself?

That is, if this EIR is unable to state with reasonable accuracy the total actual number of human casualties chargeable in all California earthquakes of under 7.1 RM to those URMBs of the types targeted by the subject ordinance, how then can any ratio be computed that would show that the annualized risk is unacceptable to the public?

Simply, has the EIR, under the "presumption of innocence principle", carried the case forward sufficiently to prove URMBs have a high risk potential?

How is high or significant risk defined? Isn't it true that biologists consider one fatality out of a million persons annually exposed to a deletrious agent to be essentially a zero sum risk, i.e. for all practical intents and purposes, not a meningful risk at all (Los Angeles Times, November 4, 1990)?

As to the main EIR document:
4-13 (4.4): ". . . the comparative method . . . is less rigorous and less mathematical". Does this attitude not attempt to toss 400 years of science - from Gallileo to Einstein - into the ash can? Is not our world a comparative one, of relationships, of relativity . . . where meanings and importance are extracted from comparisons, controlled studies (e.g. where a test medicine is given to one group but NOT to another of similar demographics), etc.?

How are earthquakes themselves defined if not as the relative movement of one part of the earth past another part? Do not scientists measure and compare the displacement before and after . . . ? Just why is the comparative method demeaned by being called "less rigorous and less mathematical"?

There is a wide range of informed opinion about future earthquake movements along the large and lengthy San Andreas fault system. The data input into the model took into account information supplied by the USGS and other sources as well.

The rate of attrition for unverified buildings in Ventura is relatively low. These buildings are relatively fire retardant. Voluntary demolitions have occurred infrequently. During the past 20 years, 27 buildings (20% of the total inventory) have been demolished. Projecting this rate forward in time, fewer buildings are expected to be demolished in the next 20 years due to changes in redevelopment programs. See the Final EIR revised text for a discussion of this issue (page 9-16 to 9-18).

The reference to page 2-18 simply clarifies one of the interpretive limitations in the model. No major conclusions about the ordinance program are implied.

Tables 12-1, 12-1 and 12-3 of the Final EIR display fatalities which have occurred during California earthquakes between about 1857 and the present. The annualized risk to the public resulting from earthquake hazards has been clarified in the Final EIR and compared to other commonly identified sources of risk. The State of California, in passing the URM law, has specifically and directly recognized the hazards of these types of buildings. Refer to the discussion of risk in the Final EIR summary.

The intent of the reference to the comparative method was not to take issue with the philosophy of science; it was merely intended to set apart empirical observations and the act of comparing these observations and making predictions based on interval measurements. The reference in this case is to the use of the Loma Prieta quake experience as a source of comparison for predicting future effects for Ventura which needs to be distinguished from the use of a computer simulation which, due to its specificity and the number of variables considered, should be regarded as a more accurate predictor of future conditions.

In this earthquake study, why couldn't we learn if a problem really exists by simply counting the number of buildings standing before a quake occurs and then afterwards count the number that suffer major damage? Wouldn't comparing the two numbers tell us what we really need to know about the degree of seriousness of the situation?

And shouldn't the same be done for casualties? Couldn't the number of fatalities be compared to the number of survivors in the stressed areas? Why doesn't the EIR then show the average annual life loss from those URMBs targeted by the ordinance(s) so that this can be compared to other life losses from other risks to which the public is daily exposed?

The EIR continues, "The comparative method is accurate to the degree that . . . prior experiences conform to . . . conditions that one is trying to predict." Taking this paragraph as a whole, isn't the writer attempting to cope with a second-level comparison without first dealing with a primary-level concern?

In conclusion, the EIR is not adequately addressing the actual problem, if there is one. It does not concern itself exclusively with the Level I ordinance as voted on December 1988 and which alone was the reason for ordering the EIR. It does study a number of other comparable issues, but these are not directly relevant to the impact of the Level I ordinance upon the community and the environment.

For practical purposes and intents that would be useful in promulgating an ordinance, no conclusive case at all has been presented that proves that the URMB is a significant life-safety risk or that annualized property damage rates are unacceptable to the public.

I plan to submit additional comments, particularly on the main EIR itself. I am an owner of URMB property.

Andy Chakires

Andy Chakires, 371 Poli St., Ventura
May 8, 1991
eircriti.ltr

The simple solution posed in paragraph 1 has been applied to building damage studies after the Loma Prieta. However, a model is necessary to predict what effects would result in Ventura if an earthquake occurs. Prediction is a far more complex procedure than recording observations.

The comparison of life loss in strengthened and unstrengthened buildings can only be performed in a reliable manner since upgrade standards were tested during the recent Loma Prieta earthquake. With time, the effectiveness of strengthening programs will be evaluated more completely. Based on all the available data, strengthened buildings (if structurally modified to an accepted and appropriate standard in relation to local seismic risks) outperform unstrengthened buildings. Refer to the expanded discussion of this issue in the Final EIR.

The EIR was scoped to address a wide range of options, not just the Level I alternative.

371 Poli St. Ventura CA 93001 (805) 653-5358

Ms Peggy Woods, Planning Division
San Buenaventura City Hall
POB 99
Ventura CA 93002

RECEIVED
MAY 14 1991
Dept. of Community Development
Planning
San Buenaventura

HAND DELIVERED TO 501 POLI STREET

May 14, 1991

Re: Public comment on
Draft Environmental Impact Report
Proposed Unreinforced Masonry Ordinance
City of Ventura Community Development Department
and accompanying Technical Appendix
by Planning Corporation, Santa Barbara, March 1991

I have an interest in two buildings that are the subject of this proposed ordinance and reside at 371 Poli St., Ventura.

Generally, my objection to the findings of this EIR (two separately bound documents: Environmental Impact Report and a Technical Appendix) are that it (1) does not directly address the assigned subject, (2) omits large amounts of possible supporting evidence, (3) fails to present adequate citations, references, documentation, etc., which hinder the review and verification of its claims, (4) fails to present the needed information in a logical, organized way, (5) includes far too many digressions, irrelevancies, and other relatively immaterial data, (6) is heavily biased in favor of only one general conclusion, (7) speculates in disciplines that are not yet established as being valid and useful, (8) is not really an environmental impact report because the majority of both texts are devoted to other subjects, (9) fails as a readable text due to mechanical difficulties in the actual printing and binding of the texts, resulting in deletion of critical data, and (10) makes no reasonable attempt to quantify environmental impacts, (11) considers no options outside of the construction field, (12) does not consider the earthquake risk in the context of other life and property risks so as to gain a net reduction of such risks, (13) and inordinately emphasizes property loss potential.

LIFE LOSS. The EIR disengenuously creates the impression that the bearing walls of unreinforced masonry buildings (UMBs) were the proximate cause of 492 fatalities in California earthquakes since 1857 (EIR 12-6, Table 12-1). This gross error is due largely to a failure to define the subject.

SUBJECT. The subject before us has two general components and two subsets, followed in turn by other possible subsets: (A) The Ventura ordinance does not target all Ventura UMBs. Excluded are private single residences. Further, as private property owners, we insist our buidings be excluded from public buildings; that is, while life and property loss data can be reported separately, the need for an ordinance must be established on the basis of life loss through privately owned UMBs, with secondary and tertiary considerations and weight, as lawful, given to lives and property lost that are chargeable to public building and property losses chargeable to

The long list of general objections in paragraph 2 of this letter are not sufficiently explicit to enable revisions in the EIR or to attempt to satisfy the commentor's objections. However, some attempt will be made to respond:

(1) The EIR scope was established by the City's review panels and City Council. The content of the document was designed to provide an analysis of a relatively large number of ordinance options.
(2) In other places, the commentor objects to the amount of evidence presented.
(3) A very complete bibliography is provided and the number of in text citations has been increased.
(4) The division of the EIR into chapters presents a discussion of upgrading issues in a logical sequence.
(5) Had much of the data not been included, an argument would undoubtedly be made that the coverage of the subject was too brief.
(6) The document emphasizes alternatives - CEQA requires that an environmentally superior option be identified.
(7) This reference is not comprehensible. To what is the commentor referring?
(8) The EIR components are more clearly distinguished and highlighted.
(9) The printing is comparable to similar reports.
(10) This is not correct; however, not all effects can be quantified with interval scale statistics.
(11) Non-structural recommendations may be incorporated into any future ordinance but such measures should be subordinate to the structural improvement objectives reviewed in the EIR. Only strctural reinforcement can minimize life loss from common sources of failure such as wall failures and parapet collapse.
(12) This issue is now addressed in the Final EIR.
(13) Property loss potential is a significant consideration in deciding upon a specific upgrade plan.

The count of fatalities in Table 12-1 refers to deaths from "bearing wall" buildings (rather than in-fill structures). The reference has been clarified to prevent someone from concluding that the deaths were directly attributable to collapse.

This comment is unclear and rather difficult to interpret. The commentor is apparently distinguishing between public and private unreinforced buildings. This distinction is not made in the law that the proposed ordinance is designed to satisfy. The point of this distinction is unclear. There are only a few publicly owned unreinforced buildings in Ventura.

private UMBs.

NECESSITY. Within this logical specifications, the basic claim that an ordinance is needed for the private sector is clearly rebutted by this EIR itself in Appendix (AP) 2-18, ". . . casualty data is not available per building type or on the basis of actual number of occupants per building." Lacking any comprehensive categorization of the data by building type and/or ownership, how can it be claimed there's a life safety need for any retrofitting ordinance? Clearly, further discussion of any ordinance should be discontinued until historians can show that this class of UMBs - the largest segment targeted by this ordinance - has a life loss ratio that significantly threatens public safety.

Building and Safety departments are charged only with saving lives, not property. As this EIR inordinately emphasizes property loss, it should make a solid case why this is almost as important as life loss. At least it should, based on historic records, project economic loss in dollars and the probability of such occurrence.

DISORGANIZED EIR. In passing, burying a general statement, such as "casualty data is not available per building type", in AP 2-18 is inexcusable organization of the text. Topic or subject sentences of general interest are normally placed in the main text with appendixes reserved for amplification, supporting detail, references, etc.

SUBJECT B. The second general component of the subject before the City Council: the limitations of retrofitting (reinforcing, strengthening), which were perhaps inadvertently revealed in "Damage to [UMBs] in the Loma Prieta Earthquake of October 17, 1989" by Rutherford & Chekene ('90 CA Seismic Safety Commission). Although its conclusions contradict the main text, a table on page 21 clearly shows that in the "Damaged" group in a 7.1 Richter magnitude (RM) unstrengthened UMBs outperformed strengthened (retrofitted) ones by a significant 16%. Also, commercial UMBs performed better than other classes, another reason we request that our privately-owned class be segregated from others for further study.

(We believe that at least two strengthened UMBs were demolished following the Loma Prieta shake, not just one as reported [probably 6th & Townsend and the building shown on the cover of this EIR].) We therefore ask for updated and detailed damage reports, including official reasons for recommending demolition, repair, etc., on every UMB suffering significant damage in this as well as all California earthquakes of the past 100 years. Only some of this information appears in this EIR [in a selective, anecdotal way].)

This B component of the subject not only suggests limits exists as to current retrofitting technology, but also it is to be noted that beyond a certain magnitude a reverse effect occurs: Retrofitting exacerbates the problem!

As more than one expert has observed, stiffening the roof-wall components encourages the roof to fall as one piece, not as several smaller pieces. As Frank Lloyd Wright said the Imperial Hotel to successfully resist the major 8.3 (RM) Tokyo quake of 1923, "You don't fight Mother Nature. You outwit her".

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The argument in paragraph 1 simply ignores the State mandate to address the unreinforced masonry problem. Also, life loss is only one consideration in deciding what type of upgrade to require. Other variables include the number of injuries, the number of buildings damaged to the point that demolition is required, effects of non-URM buildings in close proximity to unreinforced buildings, economic losses to the City from long-term suspension of business activity (in the event of an earthquake that damages buildings significantly), and other related considerations. Threats to public safety are only one consideration in deciding upon what long-term building stability and maintenance to require.

The removal of a partial phrase from one sentence in the Appendix (which the commentor has misunderstood) is not a reasonable argument suggesting the EIR is disorganized. The document was organized to be educational regarding the topic. By reading the EIR from Chapter 1 through 11, the reader should be relatively educated about what alternatives could be adopted (the final chapter).

The conclusion derived in paragraph 3 is a simple misinterpretation of the results of the Rutherford & Chekene survey. Refer to prior responses to this comment. (See, for example, Harry Hibbs's identical remarks on this topic or Rutherford & Chekene's explanation of the Table. This topic has been clarified in the Final EIR.)

The request in paragraph 5 is impossible to comply with. The EIR discusses the range of responses of strengthened buildings to the Loma Prieta earthquake. It is important to stress that Level I strengthening is <u>not</u> of building damage reduction value unless ground accelerations at the building location are relatively mild (.2 or .25 g maximum). There are relatively little data on the effectiveness of partial strengthening (such as a Level I or II program). The use of a Level III or 104F standard clearly reduces building damage. The Loma Prieta earthquake was an excellent source of information about the effectiveness of a Level III or greater upgrade compared to a Level I standard.

The final two paragraphs on this page of comments are anecdotal statements and curious; their applicability to the problems described in the EIR are unclear. After ground accelerations increase substantially above .8g, no amount of structural support will prevent an unreinforced building from dismantling unless it has been reinforced to exceed current codes.

Allowing that retrofitting was at least marginally successful in the 5.9 (RM) 1987 Whittier quake (volume 4, Earthquake Spectrum), the crossover point from success to failure for even Level III strengthening can be interpolated by educated guess to be in the 6.8 (RM) range.

Lest this limit be thought as too conjectural, consider the known fact that the increase in energy (power, force) between a 5.9 and a 6.9 (RM) shake is 31.6 times! (excerpted from a 1976 thesis, "Seismic Design of a High-Rixe Building," by J. Barnett and J. Canatsoulis, quoted in Draft Environment Impact Report, 89.122E ('89, City & County of San Francisco, CA). As these two seismic events are the only real-life field tests of retrofitting, we would argue that it boggles the mind and tests the limits of logical process that a majority of responsible engineers could honestly believe that just a few more bolts, etc. could safely maintain structural integrity on such older buildings beyond the 6.8-6.9 range!

SIGNIFICANT OMISSION. Table 12-1 omits the ranking of each serious earthquake by Richter Scale Magnitude (RM). Certainly all fatalities from quakes above 6.9 RM should be eliminated from consideration, as there is no economically feasible technology for so protecting the UMB.

Although the proponents of the ordinance do not wish to see a mass destruction of downtown Ventura, they are nevertheless poised on the horns of the dilemma:

Will the next earthquake to hit Ventura be above a 7.0 (and thus cause more damage and suffering than expected, not less) or will it be one that's below 7.0 (and hence possibly within the capability of modern technology)?

The field of governance is of course fraught with the imperative of predicting the future. Here on this one issue we admit we would not wish to be sitting in those Council chairs.

But at least it is important to define the subject. The EIR attempts to report the likely (probability of) impact on the environment. We would argue that the most important impact on the environment is the human one, not only the life loss issue but the potential for devastating economic and social losses, which Everett Millais on May 9 said the EIR did not have to address, yet in AP 1-8, Lauraine Brekke states "the EIR will address the . . . socio-economic impacts", or is there equivocation here?

Other than for computer modeling (SRM) which has no proven track record in seismology for predicting the future, the EIR gives few probability ratios and is sparse in the use of the comparative method - the basic technique of analysis employed by modern science.

Some examples: (EIR 7-13.4) "The consultants also determined that . . ." How did they determine this? What methodology or calculations did they use?
"An assumption that was incorporated . . ." This is unacceptable. At least what's the justification, the argument for this?

SUPERFLUOUS, IRRELEVANT ADDITIONS The table 12-1 (EIR 12-6) shows

The discussion in paragraphs 1 and 2 of this page address an interesting but virtually untested concern that is discussed in considerable detail in Chapter 5 of the EIR (pages 5-37 through 5-41). The degree to which building damage reduction can be achieved with various levels of upgrade is far from certain once ground accelerations reach certain maxima. However, with the range of more commonly occurring earthquake intensities, strengthening programs have been demonstrated to be effective both in reducing life loss and injuries and in helping to minimize building damage.

The latter six paragraphs of this comment review the difficult position that the decision-makers occupy in trying to anticipate future earthquake events and institute preventive measures for minimizing life loss and reducing building damage.

The question referenced on page 7-13 (4) refers to one of many assumptions made in developing a reasonably accurate profile of future damage in the City with the Seismic Risk Model. Please refer to the Rutherford & Chekene revised Technical Report in the Final EIR Appendix and prior responses to this issue.

Richter Magnitude is a measure of the energy release in a given earthquake. For each earthquake, there is only one Richter magnitude but there are many levels of shaking depending on distance from fault and local ground conditions; for this reason Modified Mercalli Intensity (MMI) is often used to describe ground shaking at a given site. MMI is a scale used to describe earthquake effects at a particular location, so for any given earthquake there could be several MMIs. MMI is often mapped into regions of similar intensity.

There is no evidence to suggest that strengthening is ineffective above a certain shaking level. More damage could be expected in a strengthened building as the shaking intensity increases, but a significant statistical improvement over an unstrengthened building would be expected for <u>all</u> levels of shaking.

It is true that most fatalities from unreinforced buildings will be from falling parapets, facades, etc. Strengthening is primarily intended to prevent that failure mode. The fatality projections in the EIR take this observation into account by estimating the number of people at risk on the street under unstrengthened walls. Fatality rates on the street are considerably higher than those for in-building occupants. See also related discussion in prior responses.

Coalinga '83 with 11 lives lost. Fact: no one died at Coalinga. It also cites fatalities for Idaho, Puget Sound, Alaska. These are relatively irrelevant as we are under State Law SB547, which ostensibly is designed to deal with the peculiarity of California soil, topology, experience, etc. with respect to California-type UMBs, etc.

It is more likely the nature of the brick and mortar in these "foreign" structures differ significantly from California style products and workmanship. Also, to rebut whatever significance the EIR writer attach to these events, we would need to widen the statistical universe of concern in order to put the problem in perspective. What is the reason for widening this universe?
Similar arguments can be made for including Fort Tejon, Hayward, and Owens Valley fatalities.

Also, what is the source for data in the column, "Estimated from URM Bearing Wall"? Estimated by whom?

Reitherman (cited in this EIR) reports 83% of all UMB fatalities are due to parapet, cornices, facades and ornamentation failure. An insurance industry study puts the figure at 2/3 for the 1933 Long Beach quake.

Bearing wall failure is not at all a significant contributer to fatalities. In fact, as adjusted, all UMB deaths within the scope of the ordinance (for privately owned structures) likely occur at the average annual rate of less than one - and continues to decline - not at all a significant risk in a California population of 30 million.

PROBABILITY. In EIR 6-1, what is the annualized probability for each magnitude?
"It is not essential to read . . ." What? We are to swallow conclusions withou analyzing their supporting data? Appropós to this inference, we demand the full data base, the computer program and the application language used in SRM, the computer model, if this is the essence of the evidence against the UMB, but more importantly we demand full documentation of all life and property loss in all California earthquakes of at least the past 100 years in order to assess whether such losses are within standard ratios of acceptable/unacceptable (threshold of sensitivity) risks.

Andy Chakires

Andy Chakires

P.S. The fatality figure for Long Beach '33 is incorrect.
In general, the table is useless for calculating risk if Richter Magnitude numbers are not included

The information about fatalities in Table 12-1 was provided by Rutherford & Chekene, the accuracy of the information has been cross-checked and has been revised and is now valid and complete. Refer to the revised text of the Final EIR for additional discussion of this table. The commentor is correct (and the consultants do not dispute) that parapet and wall ornament failures are the most common causes of injuries and fatalities in unreinforced buildings.

The model is amply documented in the Draft and even more details and explanatory comments are provided in the Final EIR. The Table 12-1 has been revised to include some of the information requested (to the degree it is available).

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CHAPTER 15

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CHAPTER 16
REPORT PREPARERS

Planning Corporation Staff

Steven Craig:	Research and Principal Writer
Sienna Craig:	Research Assistant
Lisa Knox Burns:	Planner
Scott Kopper:	Research Assistant
Peter Lawson	Research Asistant
C.A. Rowley:	Designer and Aesthetics Analyst Graphics
Diane Randall:	Computer Programmer
Carolyn Chapman:	Word Processor

Subcontractor Associates

Tom Mitchell:	Noise Consultant
Scott Schell Keith Franklin:	Traffic Consultants, Associated Transportation Engineers
Engineering:	William Holmes and Weiman Dong Rutherford and Chekene, San Francisco
Chester D. King:	Cultural Resources

CHAPTER 17

GLOSSARY AND ABBREVIATIONS

Unreinforced Masonary Terminology

Beam: A horizontal structural member.

Building Function: The predominant use of a building, defined by the activities of its occupants.

Building Type: A building defined by its occupancy, such a residential or industrial.

Chord: The top or bottom portion of a beam that carries most of the tension or compression loads induced by bending. In horizontal diaphragm panels, the boundary members that resist compression or tension due to in-plane bending of the panel.

Column: A vertical structural member.

Configuration: The size and three-dimensional shape of a building.

Costs, Direct: The costs of repairing or replacing buildings or other structures damaged or destroyed by earthquakes.

Costs, Indirect: Costs resulting from damage to buildings, such as loss of revenue.

Diaphragm: A horizontal or nearly horizontal structural element designed to transmit lateral forces to the vertical elements of the seismic-resisting system, often a floor or flat roof.

Ductility: Capability of being deformed or distorted before breaking or fracturing.

Frame: A structural system composed of interconnecting beams and columns that provide support for vertical loads without bearing walls. Lateral resistance is provided by shear walls or braces.

Hazardous Building: A building or class of structural building type that presents a hazard to life when subjected to earthquake motion.

Infill: Insertion of material, generally masonry, within a surrounding structural frame, to create a wall.

Intensity: A qualititative measure, based on observation of effects, of the severity of seismic ground motion at a specific site.

Lateral Force: Side-to-side force that pushes against a building, such a the forces created by winds or earthquakes.

Loss Estimate: An estimate of direct and/or indirect costs relating to a defined building inventory for a scenario earthquake or earthquakes.

Magnitude: See EIR Technical Appendix.

Masonry: Includes but is not limited to brick, stone, clay tile, terra cotta, adobe and concrete block construction. Can be used for both bearing walls and non-bearing partitions.

Member: A structural element that is a single piece of a building, such as a beam, column, stud, etc.

Modified Mercalli Intensity (MMI): See EIR Technical Appendix for detailed explanation. MMI is an ordinal scale measurement of earthquake intensity.

Moment-Resistant Frame: A structural frame in which lateral resistance is provided by special design of the joints between structural members.

NRHP: National Register of Historic Places.

Non-Ductile: Material or structural member that lacks the property of ductility.

Nonstructural: Material or component that is not designed to contribute to the vertical or lateral support of a building.

Parapet: The portion of a wall that extends above the roof line.

Partitions: Interior nonstructural walls.

Reinforced: Generally refers to concrete or masonry in which steel bars are embedded to increase its strength.

Retrofit: Repairing or strengthening an existing building to improve its seismic resistance.

Richter Magnitude: See EIR Technical Appendix. Richter scale is an exponential scale used to measure earthquake intensity.

Seismic: Of or subject to or caused by an earthquake or earth vibration.

Seismic Risk: The probability of earthquakes of specified magnitude or intensity occurring at a given location.

Shear Wall: A wall designed to diffuse earthquake energy forces in the plane of the wall.

Structural: Contributing to the support of vertical loads or resistance to lateral forces.

UBC: Uniform Building Code.

UCBC: Uniform Code for Building Conservation.

URM: Unreinforced masonry building. Refers to a building constructed of unreniforced masonry.

Unreinforced: Concrete or masonry that does not have steel embedded to increase its strength.

Wall, Bearing: A wall providing support for vertical loads: it may be exterior or interior.

Air Quality

AQMP:	Air Quality Management Plan
BACT:	Best Available Control Technology
RHC:	Reactive Hydrocarbons
CO:	Carbon Monoxide
NOx:	Nitrogen Oxides
THC:	Total Hydrocarbons

RHC:	Reactive Hydrocarbons
SOx:	Sulfur Oxide
AQAP:	Air Quality Attainment Plan
CARB:	California Air Resources Board
NAAQS:	National Ambient Air Quality Standards
TSP:	Total Suspended Particulates
PM10:	Particulate Matter Less than Microns in Diameter
ROC:	Reactive Organic Components

Noise

LEQ is the sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period. LEQ is the "energy" average noise level during the time period of the sample. LEQ can be measured for any time period, but is typically measured for 15 minutes, 1 hour or 24-hours.

LDN is a 24-hour, time-weighted annual average noise level. Time-weighted refers to the fact that noise which occurs during certain sensitive time periods is penalized for occurring at these times. In the LDN scale, those events that take place during the night (10 p.m. to 7 a.m.) are penalized by 10 dB. This penalty was selected to attempt to account for increased human sensitivity to noise during the quieter period of a day, where sleep is the most probable activity.

CNEL is similar to the LDN scale except that it includes an additional 5 dBA penalty for events that occur during the evening (7 p.m. to 10 p.m.) time period. Either LDN or CNEL may be used to identify community noise impacts within the Noise Element Examples of CNEL noise levels are presented in Exhibit 3.

Attenuation: The diminishing of sound levels as sound travels away from its source.

Ambient Noise: The total of all noise in a system on situation, independent of the presence of the source studied.

LIMITATIONS ON LIABILITY

The Planning Corporation shall not be liable for costs or damages to any third parties caused by delays or termination of any project due to judicial or administrative action arising out of the preparation of this EIR. This limiation of liability does not in any way alter any contractual obligations which the Planning Corporation has with the City of Ventura.